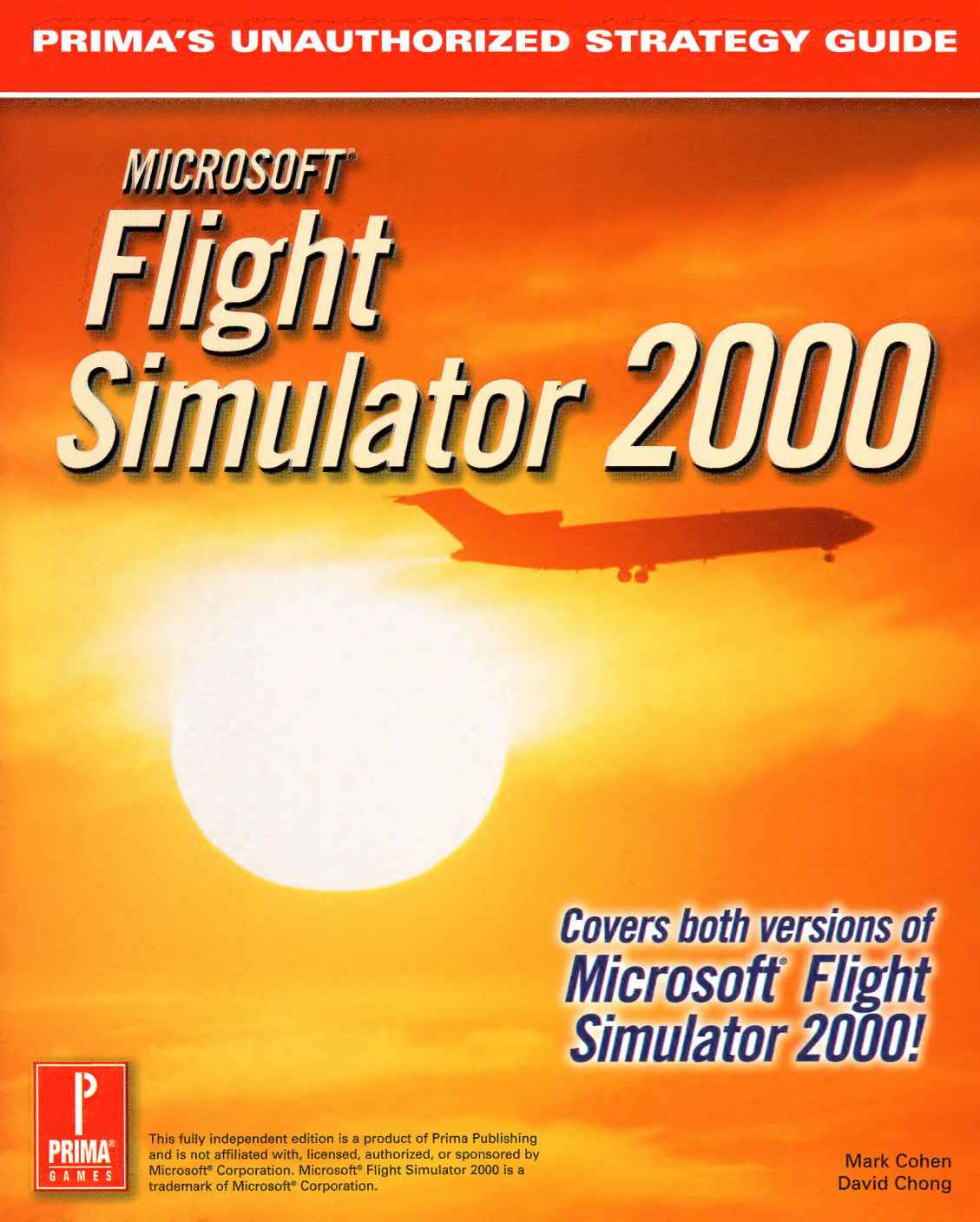
PRIMA'S UNAUTHORIZED STRATEGY GUIDE

MICROSOFT® Flight Simulator 2000



Covers both versions of Microsoft® Flight Simulator 2000!

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Mark Cohen
David Chong

Microsoft® Flight Simulator 2000

Prima's Unauthorized Strategy Guide

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I owe a tremendous debt of gratitude to two professional pilots who contributed their experience to this book. To Hank Stanley, thanks for teaching me how to handle the heavies. Even the shakiest, white-knuckle flyer should be at ease, knowing that you are in the cockpit of their 737. And, to Mike Brooks, thanks for flying along in our virtual Cessna. I knew that you had a special feel for aerodynamics back in 6th grade when you used to fire rubber bands from your retainer with pinpoint accuracy. I am proud of your achievements as a pilot, and equally as proud to be your friend for 37 years.

This book is dedicated to Fran, the woman whose love has kept me airborne for the past 20 years. Our flight has only just begun.

—Mark Cohen

For my sister Michelle, as she taxis for takeoff into a bright and beautiful future.

—David Chong

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PART I

Flight School

CHAPTER

1

Preflight Check

This book is about having fun with *Microsoft Flight Simulator 2000*. You won't have to wade through piles of aeronautical charts, take any written exams, or pass any tests to get up in the virtual skies. Technical accuracy aside, *MFS2000* is fun, and this book will empower you to have fun without having to spend hours pouring over dense text. We'll help you get into the air quickly through the use of several tutorial and walkthrough flights. Along the way, you'll learn more and more about flight procedures and techniques in painless, hands-on exercises.

THE FREEDOM OF FLIGHT

The very best thing about *MFS2000* is flying—that sensation of ultimate freedom amidst the clouds. This guide is your vehicle to this flying freedom. The game comes with an excellent manual, and this guide does not duplicate the information found there. Instead, we provide everything you need to enjoy your computer flying experience, whether you're looking for the gritty realism of

Figure 1-1
Real pilots must perform a thorough visual inspection on the ramp before each flight.

adjusting propeller pitch and fuel mixture, or just looking for the "takeoff" button.

Microsoft Flight Simulator 2000 is highly customizable; it allows you to create a recreational flight environment, a complex and realistic flight sim, or anything in-between. New in the 2000 edition are realistic weather patterns and effects that add a new dimension to your flight sim experience. A full-featured ATC (air traffic control) system allows you to gain takeoff and landing clearances from the tower, follow landing patterns and altitude assignments, or even have in-flight failures that require you to land a "wounded bird!" Despite all this complexity and realism, you may adjust the options so that novice pilots can succeed in the sky—even crashes can be ignored. Whatever realism settings you choose, there is a wealth of useful information within these pages.

Throughout this guide there is commentary and insight provided by two real pilots. Hank Stanley, a retired Navy pilot who logged 3,500 hours over 8 deployments in the Grumman S-3, and another 1,000 hours in a teaching tour in the TA-4. Hank joined American Airlines as an engineer on the Boeing 727, and is

TIP

There really *is* a "takeoff button" in *Microsoft Flight Simulator 2000*! Just hit [Y] to enter Slew Mode when you're on the runway. Hold down [Q] to move up into the air slowly. Hit [Y] again to exit Slew Mode, and voila', you're flying!

Figure 1-2
An emergency dead-stick landing in the Mooney Bravo after an engine failure. The Mooney's powerful engine is easily overrevved.

currently a First Officer on the Boeing 737-400. Mike Brooks, a 13-year private pilot with extensive flight time in the Cessna 150, 152, 172, 182 RG, Cardinal, and Piper Archer II, provides insight for small plane enthusiasts. Mike has instrument, commercial ratings, and private glider ratings. No amount of theory and instruction can compare to firsthand experience, so we are excited to offer you the valuable insights these pilots provide.

The guide is divided into three main parts that correspond to increasing levels of flight experience—perfectly suited for jumping ahead to the information most pertinent to your experience level. If you haven't flown before, Part One serves as an excellent introduction to the world of flight, including easily understood explanations of why things fly, and more importantly, what these reasons mean to you and your flying. Part Two contains sample flights for all the aircraft available in *Microsoft Flight Simulator 2000* (except for those already covered in other chapters). These sample flights are perfect for experienced pilots who are not familiar with one of

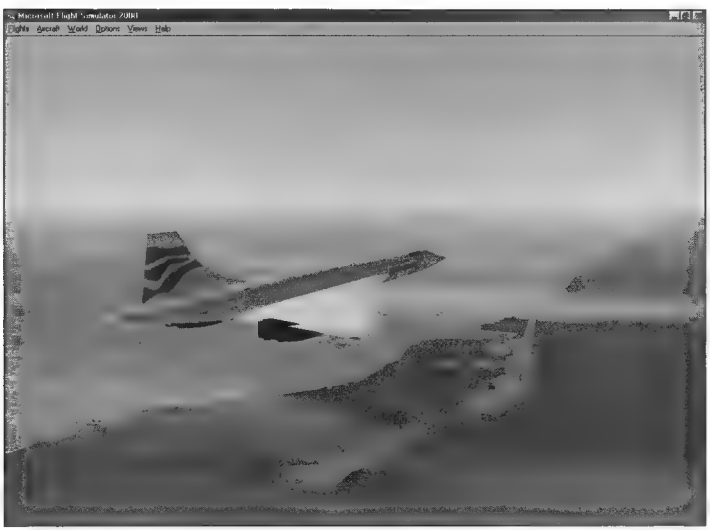


Figure 1-3
Enjoying Flight Level 30 in the awe-inspiring Concorde.

these aircraft, or for those who wish to learn more about the specific aspects of flight featured in each chapter. Finally, Part Three will challenge and educate even the veteran pilot with its instruction and examinations of advanced flight topics and techniques.

CHAPTER SUMMARIES

Chapter 1—Preflight Check

This chapter explains the content and organization of this strategy guide. Below, you'll find summaries of every chapter in the guide, which you can use in conjunction with the robust index to find the topics you're looking for.

Chapter 2—New Millennium, New Features

This chapter examines the unique features of Microsoft's flagship simulator, including details on what has changed since *Microsoft Flight Simulator 98*.

Chapter 3—Flight Primer

Making good on our promise to teach through flying, this chapter takes you on an easy flight down the Las Vegas strip. Learn how to get on the runway of your choice, take off, fly an interesting route, and even land!

Chapter 4—Aerodynamics 101

Stepping up the complexity a notch, this chapter uses simple and direct language to explain why things fly. Armed with an understanding of your aircraft and the forces that keep it airborne, you'll be prepared to take on more complex flights.

Chapter 5—Instruments and Gauges

Another step toward the next level of flight, this chapter covers the instruments on your aircraft's panel in great detail. You also get your first look at the concepts of navigation by instruments.

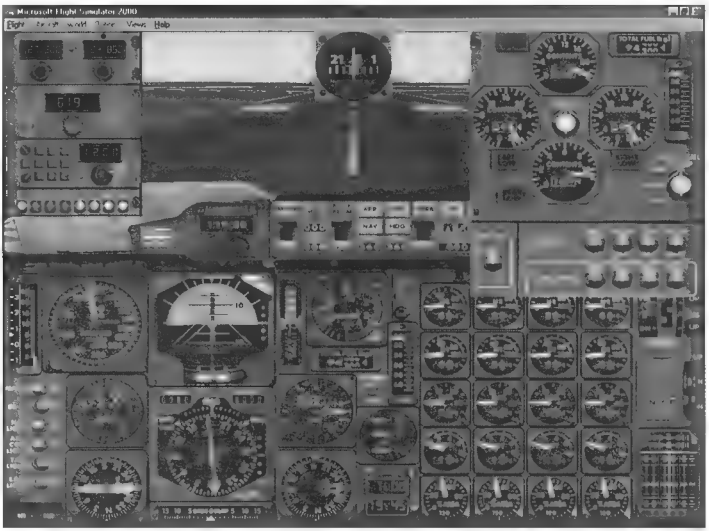


Figure 1-4
The daunting dash of the Concorde, the world's only supersonic commercial passenger airliner.

Chapter 6—Navigation and Communication

This chapter walks you through the procedures of communicating with air traffic control (ATC), which manages every stage of your flight from engine startup to shutdown. In addition, you learn how to navigate under visual flight rules (VFR) conditions.

Chapter 7—Qualifying Flights

These tutorial flights expand upon the Flight Primer, incorporating the information presented in the preceding chapters into two full flights.

Chapter 8—Across the Pond: Concorde

A trans-Atlantic flight in the world's only supersonic airliner will teach you the finer points of navigating by instruments.

Figure 1-5
Veteran *Flight Simulator* fans will enjoy the inclusion of an integrated GPS (global positioning system) device to aid in instrument navigation.

Chapter 9—Barnstorming Berlin: Sopwith Camel

Many a World War I British pilot would have jumped at the chance to fly over Berlin—only he'd be more interested in making a "special delivery" than stunt flying! Take this easy-to-fly airplane on a leisurely tour of the German capital, with a focus on low speed flight and precise control inputs.

Chapter 10—Crabbing the Coast: Beech King Air 350

This flight takes you down the coast of Southern California, where you learn how to deal with crosswinds on takeoff and landing.

Chapter 11—Sailing Up High Down Under: Schweizer 2-32

Soar over the Murray River and red gum forests of Tocumwal, Australia, using *MFS2000*'s unpowered glider! This chapter teaches you how to find the thermals and updrafts you need to keep this plane with no engine in the air.

Chapter 12—In search of Curry: Boeing 777-300

This commercial flight from Rome to Calcutta introduces the all digital instrument panel of the Triple 7. You'll be taking off at night in the largest airliner available in *MFS2000*, which is a challenge all its own!

Chapter 13—Rocky Mountain High: Mooney Bravo

The slick Mooney Bravo is challenged to the extreme in a foul-weather flight over the high Rocky Mountains.

Chapter 14—Manhattan Mission: Bell JetRanger

Take *Flight Simulator*'s helicopter on a mission-based flight through downtown New York City. You receive specific instruction on the differences between a plane and a helicopter, focusing on the special abilities of the helicopter.

Chapter 15—Home for Christmas: Learjet 45

A wintertime flight from Chicago to the nation's capital teaches you how to handle flying in poor weather conditions. Everything from low visibility to high winds and cold temperatures will hit you on this challenging excursion.

Figure 1-6
The JetRanger helicopter is a great way to get into spots that are off limits to fixed-wing aircraft.

Chapter 16—Weather or Not

In this chapter, we provide a detailed examination of bad weather flying in *MFS2000*, with advice from our expert pilots. The weather is more than eye candy: it affects every aspect of your flight from takeoff to touchdown.

Chapter 17—Emergency

This chapter helps you to overcome any in-flight emergency. One of the greatest things about *MFS2000* is its ability to put you in an emergency situation without endangering your life.

Chapter 18—Aerobatics

Learn how to execute dazzling feats of aerobatics in this challenging chapter. From barrel rolls to hammerheads, you'll push the limits of the Extra 300S stunt plane.

Chapter 19—Multiplayer Flights

Microsoft Flight Simulator 2000 allows you to fly simultaneously with up to seven other pilots. Learn how to make it a more enjoyable experience with the multiplayer challenges in this chapter.

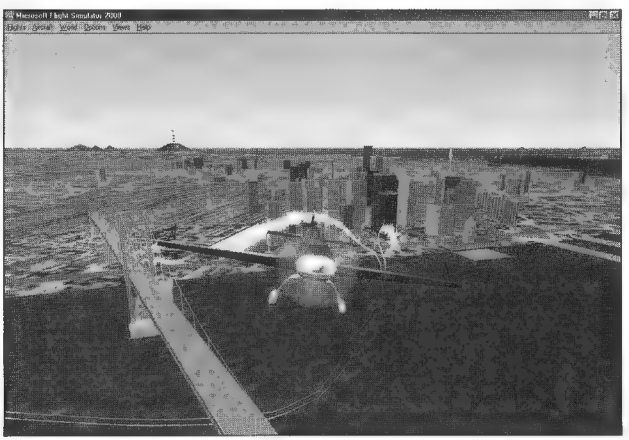


Figure 1-7
Putting the Extra through its paces.

ADDITIONAL RESOURCES

The back of the guide contains lots of additional useful information. Appendix A includes a complete list of keyboard commands. Appendix B contains navigation and communication information for every airport in the game. Finally, Appendix C is a comprehensive glossary of aeronautical terms and jargon.

CONVENTIONS USED IN THIS BOOK

Microsoft Flight Simulator 2000 offers a number of ways to control your aircraft. For clarity and consistency, all references to flight controls in this book refer to the controls in an actual aircraft. For example, when you read "pull back on the yoke," it means to apply upward elevator pressure using your keyboard, mouse, joystick, or flight yoke. On the keyboard, you would press keypad [2] to accomplish this. On a mouse, you would drag the mouse toward you. With a joystick or a yoke, you would pull it back toward you.

HINTS, TIPS, AND CAUTIONS

Along the way, we offer special highlighted sections of text that include Notes , Tips , and Cautions . Of course, you should ponder and absorb every word in the book, but these inserts are especially important.

ACRONYMS AND ABBREVIATIONS

Acronyms for specialized equipment and procedures abound in *Microsoft Flight Simulator 2000*. Refer to Appendix C if you are unsure of what something stands for, or use *MFS2000*'s built-in online help feature to identify any gauge or dial by right-clicking on it with the mouse.

CHAPTER

2

New Millennium, New Features

Microsoft Flight Simulator 2000 is an evolutionary improvement over its predecessors in Microsoft's flight sim stable. The 2000 edition is packed full of new features and options that expand the series' appeal and versatility. Meanwhile, many of the longstanding features of the game have been refined and improved upon. The end result is by far the best *Microsoft Flight Simulator* installment to date. In this chapter, we examine the changes since the 1998 release and the key features of the sim.

AIRHEADS

You wouldn't be far off the mark if you called *Microsoft Flight Simulator*'s development team a bunch of airheads. Far from being insulted, these people would be the first to tell you that they live, breathe, eat, and sleep with their heads in the clouds. The entire development team is bound by a common passion for aviation. The software engineer with primary responsibility for the flight models is an experienced flight instructor and former charter pilot with an assortment of certificates and ratings. He's also an aeronautical engineer who has worked in the aviation simulation industry most of his career. The product planner—a flight instructor—owns a CFII (Civilian Flight Instrument Instructor) and is co-owner of a venerable Cessna 210 Centurion. A pilot since the early 1970s and former editor of a national aviation newspaper, he enhances the team with a broad range of aviation experience. Another member of the development team owns and flies a seaplane.

New faces have joined the team since *Microsoft Flight Simulator 98* took off in the fall of 1997, but the team still includes several members that have been around since the original Flight Simulator by BAO (Bruce Artwick Organization). The team is rounded out by several student aviators, retired airline captains, skydivers, and even a former jet fighter pilot who flew in Desert Storm!

What does all this mean to you? Your game was developed by experienced pilots who know what it feels like up there. Thanks to their combined flight time, you can count on having the same sort

NOTE

This book is based upon the features of the Professional Edition. You may not find some features and aircraft described in this guide if you are using the Standard Edition of the software. This is easily overcome merely by using comparable options in the Standard Edition. For example, if you do not have a Mooney Bravo available to you, simply fly the Cessna 182 instead.

Figure 2-1
More important than thrust-to-weight ratios or carb heat settings, the Microsoft Flight Development Team has managed to capture the *essence* of the flight experience.

of experiences in your desktop cockpit that these folks have found in the skies. To top it all off, partners such as Cessna, Learjet, the Aircraft Owners and Pilots Association (AOPA), and FlightSafety International provided invaluable assistance in making *Microsoft Flight Simulator 2000* as accurate and realistic as possible.

ON THE INSIDE

Several new features help earn *Microsoft Flight Simulator 2000* the right to be included in the best-selling line of flight sims of all time. Some of these enhancements are within the sim itself, while others operate behind the scenes to deliver a faster, cleaner, better-looking experience to the sim-pilot. In the next few sections, we tell you about the new features in the 2000 edition and the differences between *Flight Simulator 98*, *MFS 2000*, and *MFS 2000 Professional Edition*.

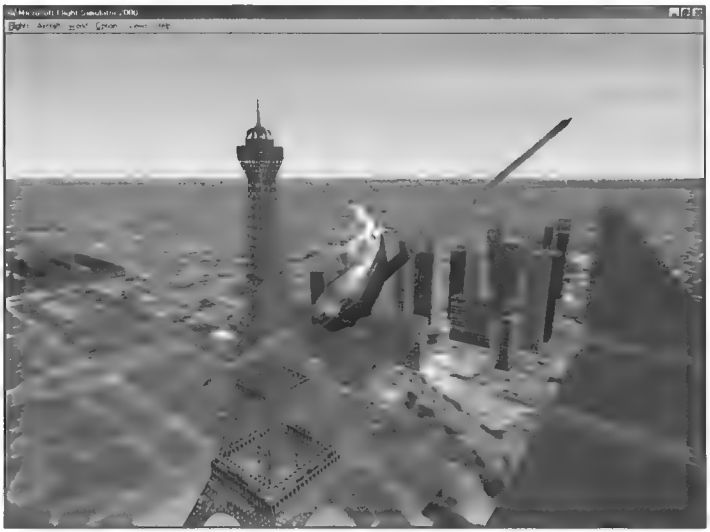


Figure 2-2
The Professional Edition includes the Mooney Bravo, which is not included in the Standard Edition.

EYE CANDY

Microsoft Flight Simulator 2000 features the latest 3-D graphics technology. Although a 3D card is not specifically required to play, we strongly recommend that you use one; even at moderate detail levels, this simulator eats up resources faster than you can say Concorde. Running in hardware-accelerated mode gives you a great improvement in performance, which in turn allows you to increase the quality (and density) of the images. At maximum graphics quality settings, *MFS 2000*'s beautifully rendered textures really take you into the pilot's seat, whether you're at 200 feet watching the highway traffic or at 20,000 feet catching glimpses of the countryside through the clouds.

A total of twelve cities are modeled in high-resolution detail in the Professional Edition. The Standard Edition features six cities in hi-res detail: Los Angeles, San Francisco, Chicago, London, Paris, and New York. The Professional Edition adds Boston; Seattle; Washington, D.C.; Berlin; Tokyo; and Rome to the list. These cities

Figure 2-3
The Dynamic Scenery is incredible; you can even follow cars down the highway!

are amazingly accurate representations, and you'll likely want to spend most of your flight time in, around, or en route to one of them. However, an additional 50 cities are rendered in moderate detail, all of which are still very attractive.

The aircraft models have all been rendered to new standards since *Microsoft Flight Simulator 98*; you'll be pleased with the new looks of the fuselages. In addition, the aircraft interiors have been redone and take the suspension of disbelief to an entirely new level with the dynamic views available in Virtual Cockpit mode. Full aircraft interiors are exquisitely rendered in lush detail, and you can even peer back into the passenger cabin of the larger planes.

Finally, the world outside looks better than ever before in the *Flight Simulator* series. Every inch of the globe is covered in richly detailed 3-D terrain. Authentic elevation data ensures that you find realistic hills and valleys in all the right places no matter where you wander. The terrain textures are all rendered in 16-bit high color, and the scaled detail levels look good and perform well from all distances. No more football-field pixels at low altitudes; now the ground looks real even if you crash in the middle of the Sahara!

Figure 2-4
Tokyo is among the cities rendered in high-resolution detail in the Professional Edition.

Every Acre an Airport

With over 20,000 airports fully and authentically rendered worldwide, it's a wonder you can ever get out of sight of one. Each airport is faithful to the layout of its real-life counterpart, right down to the taxiway letter assignments. Furthermore, all airports use the same communications and navigational radio frequencies as the real installations do; this means you can use real reference materials for assistance in your virtual flights.

New Birds

The Standard Edition features two new aircraft: the Concorde and the Boeing 777-300. The Professional Edition adds the Mooney Bravo and the Beech King Air twin turboprop. These new and beautifully rendered airplanes each excel at a unique aspect of flight, from the commercial capacity of the 777 to the powerful performance of the Mooney Bravo. Furthermore, the flight models used in the game actually earned approval from the aircraft's original manufacturers, including Bell and Bombardier.

Figure 2-5
Authentic tarmac layouts and other data ensures you'll recognize your favorite airport, no matter how obscure it is.

Figure 2-6
The King Air offers Professional Edition pilots a powerful and stable long-distance private plane.

New Menus

The pull-down menus have been dramatically redesigned since the 98 version. You'll find most of the same menu names on the toolbar, but the organization of the options within them has changed. If you're a veteran of the *Flight Simulator* series, take a moment before your first flight to browse through the new menus and get a feel for where your favorite options are located. New pilots will have an easier time with the new, more logically organized submenus.

Improved Avionics

For the first time in the history of the series, *Flight Simulator* now ships with full GPS (global positioning system) data. The little satellite dish icon on each instrument panel brings up a GPS window. Before the 2000 edition, *Flight Simulator* pilots were forced to look to third party programs to use GPS information in their aircraft. Now, this support comes with the game.

Figure 2-7
The integral GPS helps assure that you never get lost in these virtual skies!

Pilots will also rejoice over the moving map display and a detailed Flight Planner to help chart a flight plan before takeoff. The Flight Planner features a handy graphical interface, giving you the luxury of pointing-and-clicking your way to a complete flight plan without having to refer to a 20-pound airport reference book.

Two new instrument panels have been added to the Professional Edition of the game that allow you to fly the Mooney Bravo or the Cessna 182 with additional IFR (instrument flight rules) training information. One of the hardest things to master in modern aviation is flying by instruments, and these two panels help you learn the ropes. Related to IFR is the addition of an exclusive Jeppesen NavData Worldwide Database—a comprehensive listing of all the communication and navigation radio frequencies in the game! This is an invaluable pilot resource because it allows you to look up critical navigation and airport information without leaving the simulator.

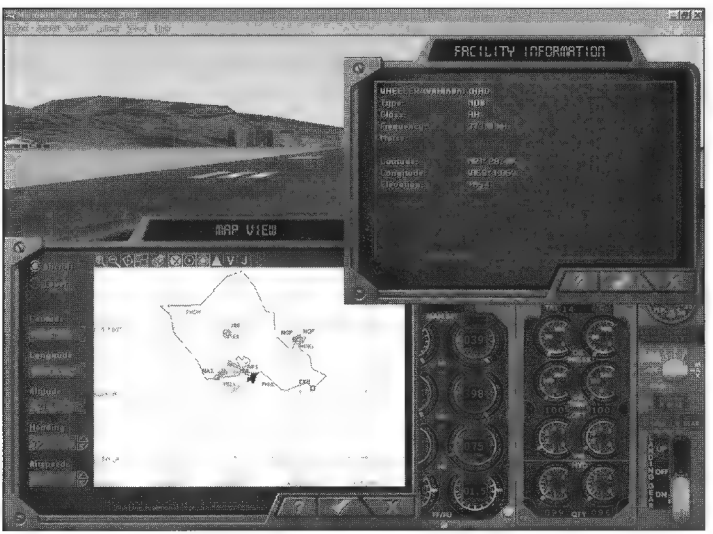


Figure 2-8
The NavData reference database is an invaluable resource for the *Flight Simulator* pilot.

Dynamic Weather

One of the most exciting additions in *MFS 2000* is the realistic weather system. Not only can you create and edit your own realistic weather patterns, but you can also download real-world weather conditions from anywhere across the globe in absolute real time. Fly in the same conditions you see out your window, or tune in to the national weather on TV, and pick your conditions to fly in! This innovative feature has never been offered before in a flight sim, and it should provide you with unending entertainment as you experience the same weather in the game that real pilots are flying in at that moment. Also improved are the effects of weather, from wind shears to jet streams to temperature effects on lift. Of course, novice pilots are free to ignore the complicating effects of weather altogether, but seasoned aviators will find the realistic weather to be a constant delight.

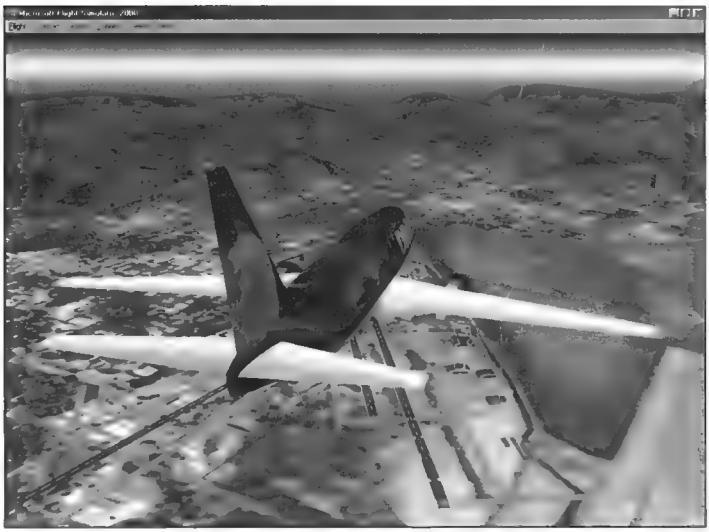


Figure 2-9
The dynamic, real-time weather models add a whole new dimension and put your heart in the cockpit.

Customizable Cockpits

Two powerful editors are shipped with the Professional Edition that aren't included in the Standard Edition. Real pilots sometimes install new or different instruments in their planes according to their personal tastes. Now you can do the same thing in your virtual aircraft by using the Instrument Panel Editor. Change the location of instruments to suit your eye, or change the appearance of the instruments you have. You can do just about anything you want to your instrument panel with the help of this powerful and convenient tool. When you're done changing the indicators, you can actually change the performance characteristics of your plane using the Flight Dynamics Editor! Increase your thrust, lower your drag, increase your lift . . . anything is possible with this handy editor.

CHAPTER

3

Flight Primer

The best way to learn how to fly is to get up in the air and start flying. Even if you crash, you can look at the flight analysis graph and learn what not to do next time—that's one advantage *Microsoft Flight Simulator 2000* has over real flight. In this section, you take an introductory flight over Las Vegas, Nevada to get a feel for what it's like to fly an airplane. Because this is our first flight, we focus on basic principles and controls, so don't worry about advanced navigational techniques. If you can see the sky above you and the ground below, you can complete this flight. First, let's tweak your software settings.

SETTING UP YOUR FIRST FLIGHT

Before you take to the skies, it's a good idea to configure your flight environment to match your computer's hardware capabilities. If using a joystick, flight yoke, or rudders, make sure you configure them properly in the Windows 95/98 Game Controllers control panel. Also make sure you have the latest drivers for your video card installed. These are easily found on the Internet at your card manufacturer's website.

Start *Microsoft Flight Simulator 2000*, if you haven't done so already, and click the Fly Now button at the main menu to place yourself in Chicago, where all adventures begin (well, all adventures in this sim, anyway). From the Aircraft menu, choose Select Aircraft. Choose the Cessna Skylane 182S and click OK to close this box.

Next, go to the Aircraft menu and choose Aircraft Settings. At the top of the Realism window you see a slide bar entitled Flight Realism; this controls how difficult flying the plane will be. Move the bar from Easy to somewhere in the middle. It's always a good idea to start flying using a more realistic flight model. If you learn to fly on an unrealistically simple setting, it's easy to pick up bad habits that are hard to unlearn. Besides, *Flight Simulator* offers many other features that make it easier to fly, such as auto-rudder, automatic landing, and an indestructible plane. We'll show you those features as you learn to fly. Click OK to close this box.

CAUTION

Microsoft Flight Simulator 2000 is very demanding on system resources. Even with a fast Pentium III, you can expect unacceptably low frame rates at the higher detail settings. Be prepared to drop the Image Quality if your flights begin to remind you of the strobe lights at your local nightclub!

Figure 3-1
Select your plane.

Go to the Views menu and choose View Options. Make sure that the Cockpit view is checked. Confirm your selection by clicking the check mark box to close the View Options box.

Getting to Vegas

Now it's time to set the stage. First, we'll place your Cessna in Las Vegas. Choose World and Go To Airport from the submenu. Look for McCarran International Airport in Vegas. You can narrow your search by choosing North America from the Global Region menu, then United States from the Country menu, Nevada from the State/Province menu, and finally, Las Vegas from the City menu. This gives you a list of the airports in and around the Vegas area. Click on McCarran Intl, and select Runway 7L from the list of runways. When you click OK, you are transported to that dusty runway in the desert.

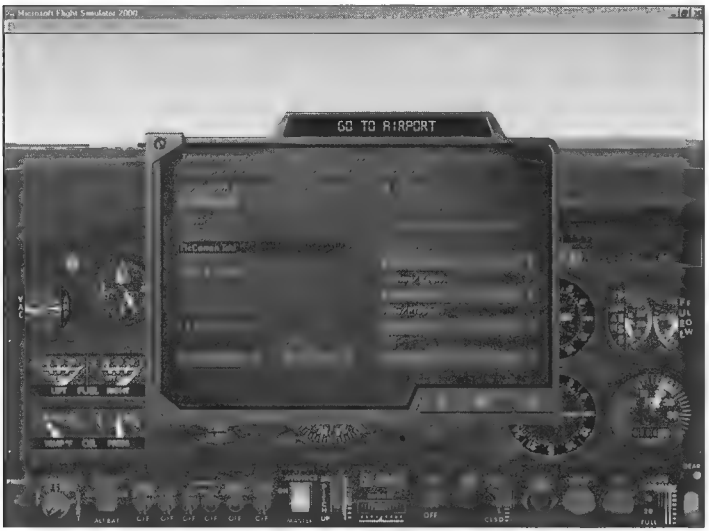


Figure 3-2
Search through the Las Vegas area Airports.

Environmental Concerns

Go to the World menu and choose Time & Season. Select Day as the time of day. Click OK. If you have a faster computer, you may want to increase the scenery complexity. Go to the Options menu and choose Settings. Select the Display submenu, and make sure you are in 3-D mode if your computer has a 3-D graphics card (if it doesn't, this game is an excellent excuse to upgrade!). Next, click on the Image Quality tab. Use the Overall Image Quality slider to adjust the settings depending upon your computer's speed. You may wish to adjust some of the specific detail settings such as Dynamic Scenery, which controls the number of other aircraft whizzing around in the air. Turn on as many as you dare, and change the Scenery Complexity to anything from Normal to Very Dense, depending on the speed of your system. If things seem too slow, you can always turn some of these options off or reduce Overall Image Quality. Click OK.

Whew—that was a lot of work. Choose Save Flight from the Flight menu, call it Vegas Primer, and click OK. Now, if anything happens to you, you can always choose Select Flight from the Flights menu and refly this scenario with these same options intact.

The Preflight Check

Now, let's preflight this baby and get her off the ground. First of all, take a look at the instrument panel. You should see two rows of dials in the center panel. On the top row, from left to right, you have the airspeed indicator, attitude indicator, and altimeter. In the second row, from left to right, you find the turn coordinator, heading indicator, and vertical speed indicator, or VSI. These are your six primary instruments, and you will find them on just about any aircraft. These instruments are indispensable, and you'll eventually learn to use them as much as you use your eyes and ears. The instrument names pop up when you hover the cursor

Figure 3-3
The instrument panel in the Cessna Skylane.

over them, and you can also right-click Help for more information. For this introductory flight, you should be fine as long as you pay attention to the airspeed indicator, the altimeter, and the VSI. We'll get to the other instruments and explain them in more detail after your first flight.

Above the instrument panel you should be able to see out the front of the plane. You can also look out other windows if you want to change your view. Let's look out the right window. Press Shift keypad 6. The "hat" switch on many joysticks changes views, too. You should see the copilot seat and the bottom of your right wing. Get in the habit of using the different views to look around. On some lessons, for example, the instructor will tell you to "clear final" and start your turn, which basically means to look in the direction of your turn before you actually put your plane in that airspace. Press Shift keypad 8 to return to the front view.

Take another look at the instrument panel. Just below the heading indicator, you see the elevator trim and position indicator (labeled Pitch). You pull back or push forward on the yoke (or

Figure 3-4
The view out of the right side of the plane.

stick) to move the elevators and change the pitch (nose up or nose down) of the airplane. The elevator trim is for making fine adjustments to pitch.

Look out the rear window by hitting Shift keypad 2 and you can see the tail, where the rudder is located. If you have rudder pedals connected, press left or right to move the rudder and change the yaw (nose left or nose right) of the airplane. Rudder pedals are highly recommended; they enable you to experience the true hand and foot coordination used by real pilots. Let's take one more glance at the instrument panel. Below and slightly to the right of the heading indicator is the rudder trim. Use this to make fine adjustments to the yaw (nose left or nose right). Before we explain the Spot Plane option, try holding down Shift and pressing all the keypad numerals clockwise from 8 to get a 360-degree view from your plane.

How to Look Around

Action	Keystroke
Straight Ahead	Shift keypad 8
Right Front	Shift keypad 9
Right	Shift keypad 6
Right Rear	Shift keypad 3
Rear	Shift keypad 2
Left Rear	Shift keypad 1
Left	Shift keypad 4
Left Front	Shift keypad 7
Straight Down	Shift keypad 5

Spot Plane View

Let's try taxiing around the runway to get a feel for how the aircraft handles on the ground. Normally, the control tower tells you to taxi to a particular runway for takeoff, or even to wait in line for takeoff clearance. Today, you own the whole airport, so let's take our time and look around.

Go to the Views menu and choose View Options. Select the View Mode submenu and click on the Spot Plane button. Go back to the Views Menu and enter the View Options menu. Drag the end of the red line in the picture to the back of the plane, just behind the tail. De-select the Gradual Transition option for faster view changes. Click OK.

The Spot Plane is an imaginary plane that constantly follows you at a specified distance and altitude. Think of it as your own personal movie camera. It's much easier to maneuver on the taxiways from the spot plane view, so use this view when you're

Figure 3-5
The Spot Plane View.

lining yourself up for takeoff. If the spot plane view doesn't show itself when you close the View Options box, hit S three times to see your plane from the back.

As part of our preflight check, let's make sure the flaps are working. Press [[&]] to extend the flaps 10 degrees. You should be able to see the flaps working (look toward the rear, or trailing edge, of the wing). Now let's check out the rudder and yoke. I know—we did this earlier—but it never hurts to double-check. Because this is your first flight, it gives you another chance to see the relationship between your keyboard/joystick controls and the mechanics of your plane *before* you are airborne. Move the yoke left and right to adjust the ailerons. You should see the ailerons moving up and down on the trailing edge of the wing. Pull back on the yoke to work the elevators on the tail. Look on the vertical stabilizer and you can see the rudder move when you press the rudder pedals or the default keyboard commands, 0 and Enter.

CAUTION

At press time, rudder controls were sometimes unpredictable in MFS2000, with certain joystick/rudder pedal configurations. A patch should be imminent, but until then, select auto-rudder or assign a different control if you have a hard time controlling your pedals.

It's time to start rolling. Press . to disengage the parking brakes and increase throttle about 10 percent until you begin moving. Use the yoke to steer yourself back and forth, and control your speed with the throttle. Take a look at the entire airport. See if you can find the refueling area, which is a big yellow F surrounded by a square. Try to stay on the taxiway or the runway, but don't worry too much about veering off; the whole state is practically one big runway, after all. When you want to return to the cockpit view, hit S again.

TAKEOFF!

Now it's time to take to the skies. Get yourself to one end of the runway and face the right direction (that's with the long part in front of you). Press . to release the parking brakes (if you've got them on). Make sure you're pointed down the center of the runway. If not, increase the throttle to about 2,000 rpm and steer with the rudder pedals or yoke until the plane is centered. Make sure your flaps are extended 10 degrees (for short runways only; most takeoffs do not require flaps), then increase the throttle to full.

Figure 3-6
Lining up for takeoff on the runway.

As the plane builds up speed, make (very) small corrections with the yoke to keep the aircraft pointed down the runway centerline. When the Cessna reaches takeoff speed (60–70 knots), the nose should lift off the runway, and your plane will rise gracefully into the air. If this doesn't happen and you're getting close to the end of the runway (for example, you can read the numbers on the other end and see mice hiding in the grass), then pull gently back on the yoke to lift off. Don't pull back too far or you might stall. If you do stall, just push the stick forward slightly until the plane picks up speed.

Maintain a nice gentle climb; if you're looking at nothing but sky, you're climbing too steeply. Adjust your pitch by pushing forward or pulling back on the yoke so that your airspeed stays at about 80 knots. After you pass the end of the runway, retract your flaps. This reduces drag and helps your plane present a more streamlined shape to the relative wind. Notice that your airspeed rises. Reduce the throttle a little bit. Congratulations—you're flying!

TIP

Use delicate inputs on the controls when using nosewheel steering on the runway! A little push goes a long way, and there is a bit of a lag time between your control input and the change of direction.

Figure 3-7
Rotate the nose into the sky for a gentle takeoff.

FLYING HIGH

You should continue to climb until you reach an altitude of 2,000 feet. We're going to practice flying straight and level right now. At this point, you'll notice that it requires constant pressure on the yoke to maintain level flight. Instead of constantly using the yoke, try changing the pitch of the nose by using the elevator trim to keep the needle on the VSI near zero. By gently adjusting the attitude, or pitch of the airplane's nose, you can achieve level flight without constant pressure on the yoke.

Try to maintain an altitude of 2,000 feet. Make small, smooth corrections to your flight path. The airplane controls are sensitive, and it's easy to fall into the trap of constantly overcorrecting up and down to match the movements of the VSI. Pilots call this "chasing the needle." Make a correction first, then wait to see if the needle settles down. It's better to make a series of small corrections rather than overcorrecting and having to swing back the other way.

Pitch Controls Airspeed, Throttle Controls Altitude

When you're comfortable flying straight and level, try pitching the nose up above the horizon by pulling back on the yoke. Notice what happens to your airspeed? Now pitch the nose below the horizon. Watch your airspeed climb back up. *Pitch is the primary control of your airspeed.*

Return to straight and level flight. This time, maintain your pitch and reduce the throttle to 1,500 rpm. Watch what happens to your altitude. Pitch the nose up slightly to maintain a constant altitude, then increase the throttle to 2,500 rpm. What happens to your altitude? *The throttle is your primary control of altitude.* If you increase the throttle, you ascend. If you decrease the throttle, and you descend. This is much more evident when maneuvering at minimum airspeeds, such as when you are trying to land the plane. Knowing how to make adjustments in the pitch and the throttle to maintain a steady descent rate is the key to controlling your aircraft.

Banking on Turns

Tired of flying straight and level? Let's try some turns. The standard rate of turn is shown on the attitude indicator.

Take a look at the artificial horizon. Directly above the triangle is a series of white marks in 10-degree increments to the left and right. When the horizon is level, the triangle is centered. As you turn, the white marks move above the triangle to indicate degree of bank. Try a 20-degree left bank. As the plane banks, refer to the turn coordinator (to the left of the heading indicator) to set a standard rate turn of 3 degrees. This is indicated when the wings on the gauge line up with the horizontal hashmarks on either side. After the 30° mark, the next two hashmarks represent 60° and 90° banks. Two more marks (15° and 45°) appear beneath the artificial horizon line.

In a turn, generally you need to pull back slightly on the yoke to maintain a consistent altitude. This need increases as the turn becomes steeper. It is also increasingly difficult to monitor your pitch during a turn, because the plane on the attitude indicator no longer lines up with the artificial horizon as it does during level flight. If you do not maintain proper pitch during a turn, you will

TIP

Don't forget to decrease pitch when you come out of the turn and return to level flight.

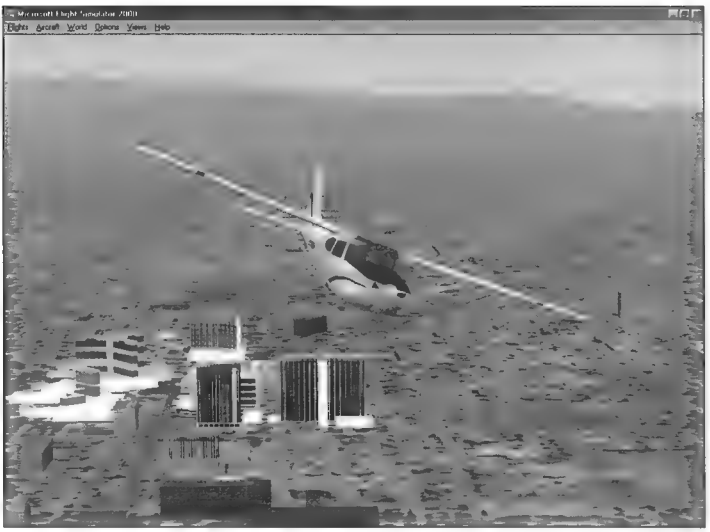


Figure 3-8 Executing a gentle turn.

lose altitude quickly. Fortunately, the gauge also includes an orange ball that sits between the wings of the plane. If the ball falls below the horizon line during your turn, adjust your plane's pitch with the stick or elevator trim to maintain a level turn.

If you like, fly into downtown Las Vegas and check out all the casinos. If you get close enough (and you have Detailed Scenery turned on in the Preferences), you can actually read the names of the hotels! Can you find the hotel where Siegfried and Roy are playing? There are also a couple of well known musical groups playing in town—can you find out who they are? How about the Luxor Pyramid? Don't forget to reduce your throttle to about 75 percent, and watch your altitude; don't crash into anything!

LANDING

In *Microsoft Flight Simulator 98*, you could cruise back to the vicinity of the airport and select Land Me from the Aircraft menu for a

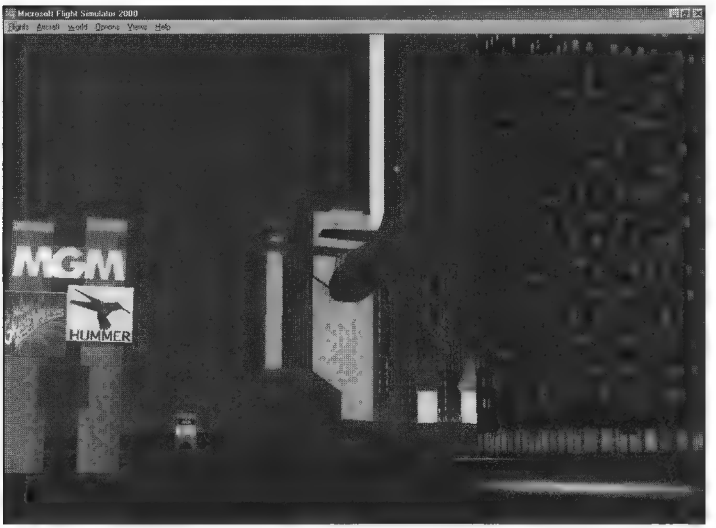


Figure 3-9
Scout out the lucky tables in downtown Vegas.

perfect landing every time. Sorry, there is no free ride in *MFS2000*; you must bring it in yourself. Fortunately, your Cessna 182S is relatively easy to land if you follow a few basic guidelines. That's not to say that your first attempt will be successful. Keep the Flight Model settings at medium realism so that you don't develop any bad habits during your first few attempts. However, you might want to keep Off-Runway Crash Realism turned off. This way, if you overshoot the runway, you won't have to watch your Cessna go nose up into the cactus.

From here, you have two choices depending on your level of experience and/or sense of adventure. If this is truly your first attempt, click on the Flights menu, click Select Flight, and then select Tutorial 7, Situation 1 for a landing at the Mojave Airport. This is the landing used in the *MFS2000* Flight Manual. When you take over the controls, the plane is already pointed toward the runway. All you must do is maintain a speed of 65 knots, keep the wings level, and land the plane. Your first few attempts might be a

little rough, but you'll quickly get the feel for proper speed and alignment. Study the tutorial text and repeat the landing several times by pressing Ctrl + ; to reset the flight.

However, if you'd rather not leave Las Vegas for the safety of the tutorial, follow along for instructions on bringing your Cessna 182S back to McCarran. When you took off from Runway 7L, you were heading almost due east. If you turned to check out the hotels on the strip, you might be facing north by now, approaching the Needle pictured in Figure 3-10. Of course, it is a little difficult to guess where you are, but the important point to remember is that your plane and McCarran International Airport represent two points in a rectangle. Depending on your current location, you need to begin making turns within the rectangle that will bring you back to the airport for a final approach from the west. You can use your views to check out your location and figure out which way you must turn, or you can click Flights, and then Reset Flight to start over again at the beginning of the rectangle.

Figure 3-10
If you are facing the hotels on the outskirts of town, the airport is behind you.

We will cover landings in much greater detail in Chapter 7: Qualifying Flights, when we break down the rectangle into five segments: departure, crosswind, downwind, and base legs, followed by the final approach. For now, our goal is to make a series of 90-degree turns that will leave you heading east into McCarran. The rectangle concept forces you to make broad, sweeping turns, rather than tight angles that leave you out of position and flying too fast for a comfortable approach. Your last 90° turn from the base leg into your final approach is critical. If you must miss this turn, go a little too wide, rather than tight. If you cut the turn too sharply, you may not have enough time, or room to slow down and center your plane to the runway.

Ideally, your speed should be around 80 knots on the base leg (with 20 degrees of flaps), 70 knots on long final, and 60–65 on short final, with full flaps (when you know that you have the runway in your pocket).

As we mentioned earlier, flaps increase the wing's lift (causing pitch up), and increase drag, which translates into a faster descent. If your plane is too high in the base leg or final approach, flaps can reduce your speed while increasing the rate of descent to bring you back to the preferred range. Because flaps increase lift, you must also remember to push the stick forward to compensate, and then continue to trim the elevator during the approach.

In Figure 3-11, our Cessna 182S is on long final, but coming in too fast at over 100 knots. However, we had enough room to apply flaps, slow our speed, and line up for a near-perfect landing.

When you are 5–8 feet off the deck, bring the throttle way down and begin your flare, by gently pulling back on the stick. If you hear the stall warning as you touch down, you have landed at the perfect speed. Once on the runway, kill the throttle and pump the brakes firmly, but don't stand on them, or you might turn your plane on its nose.

NOTE

Although we took off from Runway 7L at McCarran, you can land on 7L or 7R. Note that the inside runway, 7L starts earlier than 7R, so your final approach should be a little longer. We did not plan for the longer runway, so we opted for 7R, rather than trying to overcompensate too quickly.

TIP

If you apply full flaps too early, and you realize that you are going to miss the runway, your plane will drop like a stone. To avoid this disaster, don't retract the flaps fully until your wheels are almost on the ground.

Figure 3-11
Lined up and ready for final approach.

As you turn off the runway, give yourself a pat on the back for a job well done. Now that you've had a taste of flying (and landing), let's go back to the classroom for a more in-depth look at the principles of flight.

CHAPTER

4

Aerodynamics 101

Figure 4-1
The Wright Flyer took Orville just over 100 feet to windward on its maiden flight. If it hadn't been for the headwind, the plane would have actually traveled about 550 feet!

My observations have since only convinced me more firmly that human flight is possible and practicable. It is only a question of knowledge and skill just as in all acrobatic feats.

—Wilbur Wright, 1899

THE WRIGHT STUFF

Now that you've had a taste of what it's like to fly a Cessna, let's find out a little about what's going on behind the scenes—or above the wings, in this case.

What is Flight?

Many different things go up in the air. Some glide, some float, some are pushed. In 1783, the Montgolfier brothers constructed the world's first hot-air balloon and demonstrated it before the prestigious Academy of Sciences in Paris. Their balloon floated for

eight minutes over a distance of nearly two miles; this was the first manned flight. Today's space shuttle, in contrast, is pushed into orbit by rocketsand, and when it reenters the atmosphere, it glides in for a landing.

But how do things actually fly? An engine may get a plane moving, but it's air pressure that keeps a plane in the air. Air exerts pressure on all things: 14.7 pounds per square inch at sea level. That means that on the top of your head, air exerts a pressure of nearly 800 pounds. On the wing of a four-hundred-ton jumbo jet sitting still on the ground, 350,000 pounds of pressure is exerted on both the top and the bottom surfaces.

Because air pressure is virtually the same on all sides of an object at rest, the forces of pressure are balanced, so we do not feel them in any direction. But if some of the pressure on top of an object (such as an airplane wing) is reduced while the air pressure on the bottom surface remains the same, the greater pressure on the bottom eventually becomes enough to counteract the force of gravity and push the object upward. This is flight, with lift being accomplished by the wing's special shape.

So, from this definition we can say that anything that uses a difference in air pressure to generate lift is flying. A rocket may go up in the air, but it is not technically flying any more than a rock is flying when thrown. Thrust in a vertical direction, whether caused by engines or by the motion of your throwing arm, does not generate lift; to create lift, something must cause a difference in pressure. It wasn't until the Wright brothers put thrust, wings, and a control method together that the world's first airplane flew at Kitty Hawk, North Carolina, in 1903.

The Four Forces of Flight

In addition to the force of lift, three other forces act on an object in the air: gravity, thrust, and drag. An airplane has a force acting in each of four directions—up (lift), down (gravity), forward (thrust), and backward (drag).

Total drag includes induced drag, a byproduct of lift. Drag is caused by friction of the air over the skin of an airplane, while thrust is supplied by an engine. When an airplane flies straight

Bernoulli's Principle

In the 18th century, Swiss scientist Daniel Bernoulli performed a number of experiments that explored the nature of fluids and pressure. While observing water flow through a set of pipes, he discovered that the water accelerated as it went around the curves. More importantly to modern flight, Bernoulli found that the water exerted less pressure on the sides of the pipes as it whisked around the curves at this higher speed.

This property of speed and fluids is of central importance to the concept of flight. A plane's wings are made in the shape of an *airfoil*, as depicted in figure 4-2. This special shape forces air flowing across the top of the wing to travel a longer distance than the air flowing across the bottom because of the extra curve on the top side. Because you can't create new air to fill a gap, the air must flow faster over the top to reach the trailing edge of the wing at the same time as the air that flowed across the bottom of the wing. That faster-moving air exerts less pressure on the top of the wing.

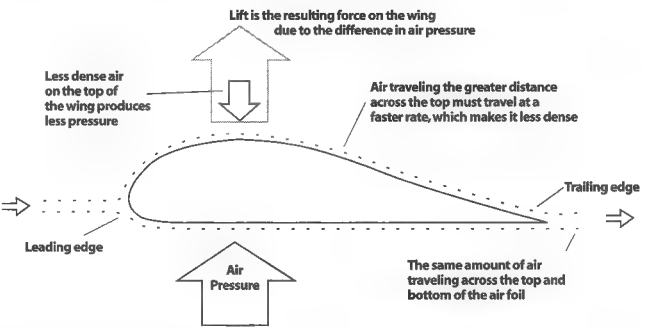

Lift is the resulting force on the wing due to the difference in air pressure
Less dense air on the top of the wing produces less pressure
Air traveling the greater distance across the top must travel at a faster rate, which makes it less dense
Trailing edge
Leading edge
Air Pressure
The same amount of air traveling across the top and bottom of the air foil

Figure 4-2 Cross section of a wing, showing the special airfoil shape responsible for generating lift.

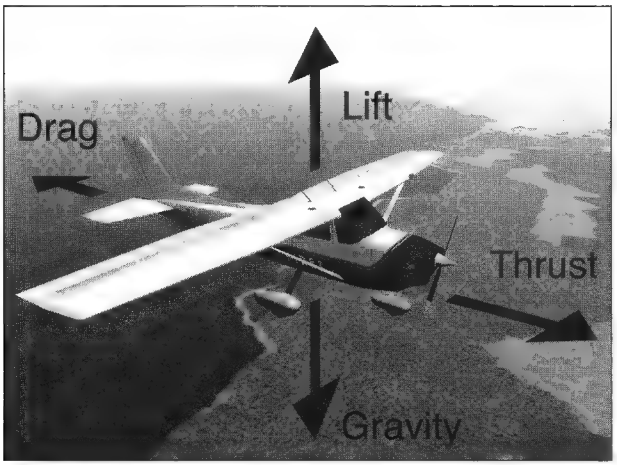


Figure 4-3
The four forces of Flight: lift, gravity, thrust, and drag.

and level at a constant speed, the opposing forces are balanced. Lift equals weight; thrust equals drag. There is enough thrust to both overcome the drag and produce enough airspeed to create enough lift to counteract gravity. However, lift is the force directly responsible for flight.

Wings and Things

In addition to the lift generated by their airfoil shape, an airplane's wings can generate additional lift by deflecting air downward, similar to how a snowplow deflects snow off to the side. The angle at which an airplane's wings meet the oncoming air is called the angle of attack (Figure 4-4).

As the air hits the bottom of the wing it is deflected downward, resulting in a "push" upward. This is explained by Newton's First Law of Motion, which states that for every action there is an equal and opposite reaction. You can feel this push by simply holding your hand out of the window of a moving car. Hold your hand parallel to the road, and nothing happens. But when you tilt up the leading edge of your hand to increase the angle of attack,

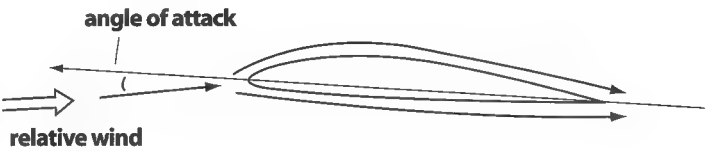


Figure 4-4
The angle formed by the direction of the oncoming air and the orientation of the wing is called the angle of attack, or AOA for short.

your hand experiences lift and starts to rise. When you consider the moving car, you can also demonstrate the effects of increasing or decreasing thrust. As the car slows down, (decreasing thrust), you must increase the angle of attack (tilt the leading edge higher) to maintain lift.

In an airplane, you increase the angle of attack by pulling the nose up; this changes the angle at which the leading edge (wing) meets the oncoming air. You can also achieve lift by extending the flaps downward. Although the flaps are on the trailing edge of the wing, they deflect more air down when extended, thus creating extra push to compensate for reduced airspeed or greater rate of descent.

The greater the angle of attack, the greater the amount of lift. However, there are limitations; if a wing is tilted too much, the air passing over the top of the wing begins to separate from the surface, creating turbulence and destroying the lift. This condition is known as a stall.

The amount of lift a wing generates depends on several factors: airplane speed, angle of attack, wing shape, and wing surface area. In chapters 8 through 16 of this guide, you'll learn more about shifting the balance between these factors as you respond to changing conditions. Only by responding to the characteristics of your airplane and the ever-changing conditions of flight will you be able to achieve the most efficient and effective lift possible.

Pitch

The elevator controls your pitch. Pitch refers to the angle of the airplane's nose to the horizon. You pitch the nose of the aircraft up

Figure 4-5
This aircraft has about a twenty-degree negative pitch, which means its nose is pointing toward the ground.

by pulling back on the control yoke. You pitch the nose down by pushing forward on the yoke. When the nose is pitched down, the aircraft's speed increases. When the nose is pitched up, the aircraft's speed decreases. See how complicated this gets? You'll hear a lot more about pitching too high when we discuss stalls, but for now remember that you control the aircraft's speed primarily by changing the aircraft's pitch relative to the horizon. Pitch the nose down to pick up more airspeed if you're going too slowly.

Roll

The ailerons—movable surfaces near the wing tips—control roll, or bank angle. When you turn the yoke (or move the stick) to the left or right, the ailerons move simultaneously in opposite directions, causing the aircraft to roll. When you roll left, the left wing dips down because the downward deflection of the aileron on the right wing creates more lift on that side. At the same time, the aileron on the left wing deflects upward and reduces lift.

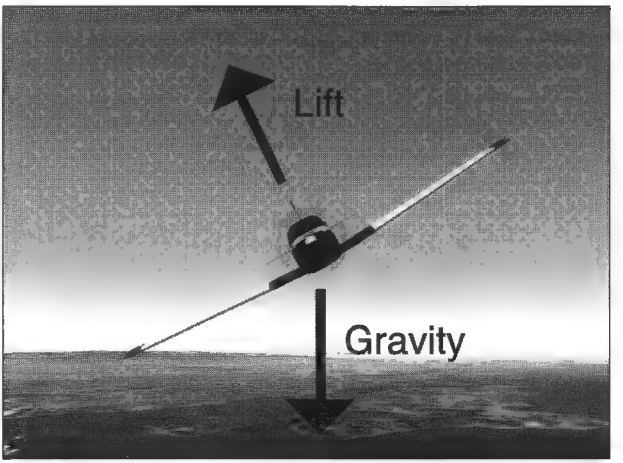


Figure 4-6
A banking plane needs greater lift to maintain altitude because its wings are no longer generating lift in direct opposition to gravity's pull.

The direction of lift is always perpendicular to the wing's surface, so when you bank the wing, you decrease the amount of vertical lift you're getting. The horizontal component of lift is what makes the airplane turn. If your bank angle is too great, you can stall the plane. Consequently, in a normal banking turn, you coordinate your roll with the elevator and the rudders to maintain your altitude and complete a nice, smooth turn.

Yaw

Yaw is the adverse effect of using ailerons. When a plane banks, or rolls to the left, it also wants to turn, or yaw to the right. This is caused by the increased surface projected by the ailerons. By projecting down into the airflow, the very same surface that provides additional lift also causes increased drag on the same side. So, while the plane rolls to one side because of increased lift, it wants to slide over to the other side because of the increased drag on the same side.

This is where the rudder comes into play. Technically, yaw is rotation about the plane's vertical axis. In practice, you must learn

how to use the rudder to coordinate your turns while coming in for a landing approach in a crosswind. If you've ever seen a plane fly sideways, the pilot was using the rudder opposite the ailerons to keep the plane on a constant heading.

A Little about Stalls

A stall, in general, is a bad thing. It occurs when the wings are no longer providing lift; without lift, the plane falls. The wing's curved shape allows air to flow smoothly along its top surface, but if the angle of attack becomes too large, this property is destroyed. The air begins to separate from the surface of the wing, creating turbulence and disrupting the smooth airflow, and this destroys lift. This condition is known as a stall.

Any wing will stall, regardless of how fast or how slow you're going, because every wing has a critical angle of attack. When you exceed this angle, you stall. But, depending on your altitude or situation, this condition won't be fatal and may even be desirable. Simply put, you can recover from a stall if you have enough altitude. However, stalling on takeoff or while descending on a landing approach could prove disastrous. In fact, a picture-perfect

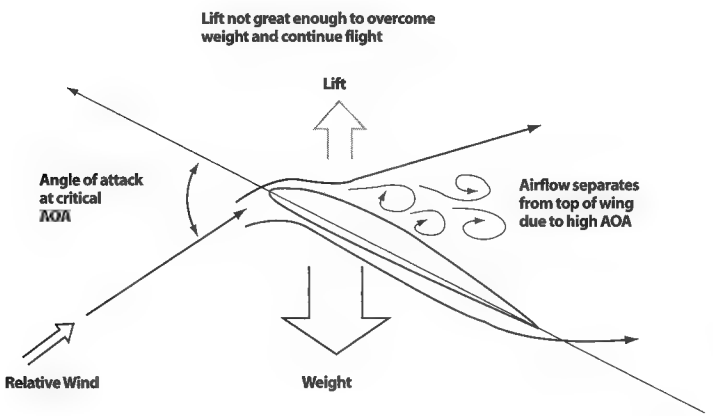

Lift not great enough to overcome weight and continue flight
Lift
Angle of attack at critical AOA
Airflow separates from top of wing due to high AOA
Relative Wind
Weight

Figure 4-7
A stalled wing.

landing includes an intentional stall of the plane just as it touches the ground. In that case, stalling at just the right moment is ideal.

You can also stall your airplane by applying only one part of the wing to an excessive angle of attack; this is an aileron stall. This occurs most often when your plane is already flying at a high angle of attack (pitch up), and you push the stick too far to one side. For example, a left bank bends the right aileron down, causing increased lift under the right wing. If the bank is too hard, the resulting lift is excessive and the right wing stalls. The right wing then drops suddenly, and the plane enters a spin to the right.

Eventually, you will become very familiar with the stall point of your plane by learning how to intentionally stall it and then recover. Furthermore, landing your plane will be far less intimidating when you learn to come in low, slow, and silky smooth by using your new best friend, the stall.

CHAPTER

5

Instruments and Gauges

Microsoft Flight Simulator 2000 has an aircraft for your every mood, whether you want to soar with Snoopy in a Sopwith Camel or do loops and Immelmans in your Extra 300S. With 11 planes to choose from, you can fly fast or slow, high or low, or just glide, accompanied only by the sound of your breathing.

Each cockpit has a wide range of instruments and gauges, from the crowded dashboard of a Beech King Air 350 to the sleek, virtually gauge-free, digital panels of the Boeing 777-300. But, despite their differences, these planes share a core group of instruments that deliver critical information to you before and during your flight.

In this chapter we look at the basic instruments common to most aircraft. Rather than cover every instrument you'll encounter in *MFS2000*, we focus on the core group of dials and gauges that you can count on for safe flying. We cover the actual instrumentation panels of each aircraft in the theme flight; chapters 8-15. The

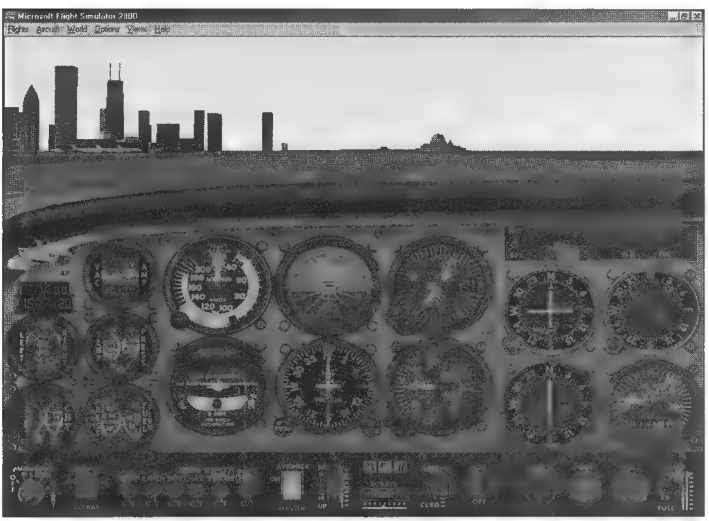


Figure 5-1
Even the little Cessna 182S presents a confusing array of gauges to the novice pilot.

remaining planes are featured in Chapter 3—Flight Primer, and Chapter 7—Qualifying Flights.

THE INSTRUMENT PANEL

Although the instrument panels of the various aircraft in *MFS2000* differ, some dramatically, they all share the same basic instrumentation. Placement and appearance of the core instruments and gauges may vary also, but they are still easy to spot. For example, the altimeter in the Schweizer 2-32 glider pictured in Figure 5-2 is similar in style and appearance to the same gauge in the Beech King Air 350 (Figure 5-3). The important fact to remember is that an altimeter always displays your current altitude, whether you are flying the Concorde or a Cessna. Once you become accustomed to what each gauge tells you, it is just a matter of orienting yourself to a panel before you take off and apply your flying skills to a new aircraft.

Figure 5-2
The Schweizer may lack an engine, but it still has an altimeter.

Figure 5-3
The Beech King Air 350 altimeter has an extra inset display, but it still delivers a clear reading of altitude.

For the sake of continuity, this chapter uses the instrument panel of the Cessna 182S, which is featured in Chapter 3—Flight Primer. The gauges are large and easy to spot, making this plane the perfect choice for first-time flight simmers. The following sections include explanations of each gauge on the 182S panel, moving generally from left to right.

Primary Instrument Cluster

The primary instrument cluster consists of six gauges that provide the most important information about an airplane in flight. They are larger than the surrounding gauges and, on most panels, are clustered together directly in front of the pilot. The indicators are from left to right on the top row: airspeed, altitude, and altimeter; and across the bottom, turn coordinator, heading, and vertical speed. Although you will need considerably more information to pilot a Boeing 777, you can accomplish steady flight in any aircraft with a

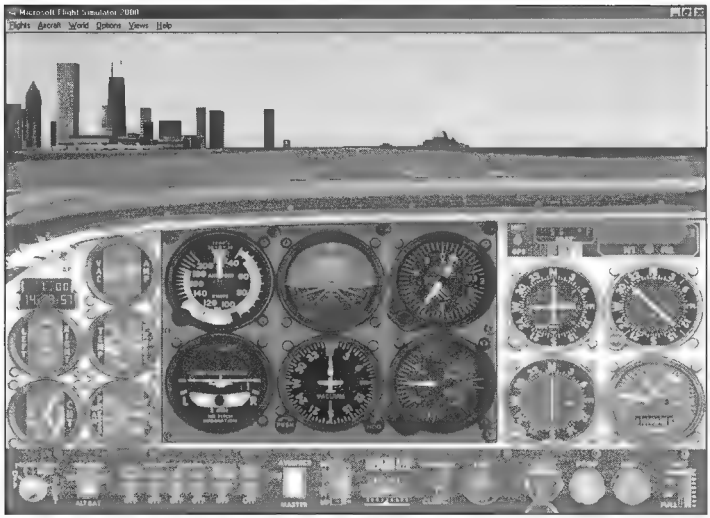


Figure 5-4
The primary instrument cluster of a Cessna 182S waiting for clearance at Chicago's Meigs Field.

thorough understanding of these indicators. The following sections explain each instrument's function and application in flight.

Airspeed Indicator

Arguably the most important instrument in your cockpit, the airspeed indicator displays your plane's speed relative to the air around it. This measurement, expressed in knots (nautical miles per hour), is called *indicated airspeed*. Don't get too hung up on the "speed" part, because indicated airspeed is considerably different than your actual speed relative to the ground, which is called, amazingly enough, *ground speed*.

Although the airspeed indicator delivers a value in knots, it is actually a measure of the impact of the air against the airplane as it flies. This pressure increases as a plane flies faster, and conversely, decreases as a plane slows down. So, by converting air pressure to knots, or miles per hour, you have a generally accurate measure of airspeed.

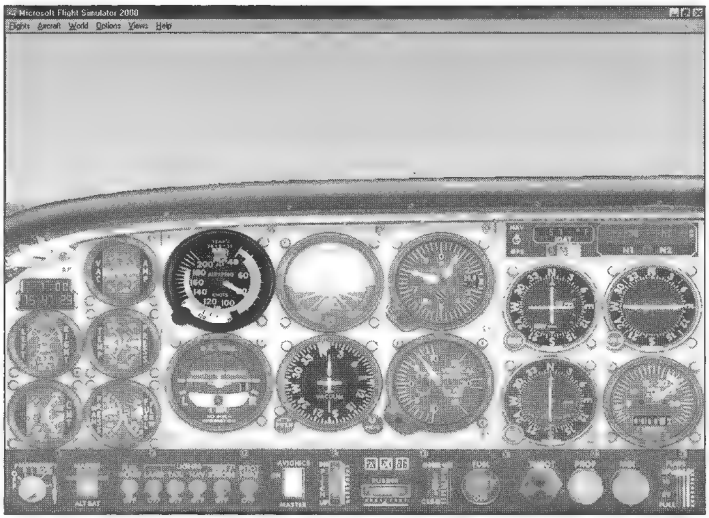


Figure 5-5
Airspeed indicator

You're probably wondering how a pilot can depend on a gauge that is only "generally accurate." Here's how it works in the air. The conversion of pressure to miles per hour is based on average air of moderate temperature near sea level. If you take a plane traveling at 160 miles per hour and move it from 1,000 feet to 40,000 feet, it will move faster, because the air at high altitude is not as dense as air at sea level.

Wind is also a factor. If you fly into the wind, its speed is subtracted from your indicated airspeed. Flying with the wind, your ground speed would be considerably faster than your indicated airspeed, because the wind is moving you along in addition to your thrust.

The bottom line is that the airspeed indicator is a less-than-accurate tool for measuring actual speed, or estimated time of

arrival at your destination. However, it is an effective indicator of stall speed, which is the single most critical number for any pilot.

Note that there are several colored bands that span certain airspeeds. These are reference ranges for your aircraft's performance. The white band delineates the safe speed range (40–95) in which you may use your flaps and landing gear, the lower end of which is your flaps down stall speed. Likewise, the green bar (50–140) bottoms out at your flaps *up* stall speed. The yellow band is your caution speed range (140–180), in which you should avoid stressing your plane with high G loads. At speeds above the red hash mark, you are in danger of damaging your aircraft because you are exceeding the designed performance limits of your airframe.

CAUTION

A plane's documented stall speed is based on relatively level flight at normal weight. There are additional stresses that can raise the stall speed for an airplane, including additional weight or pushing the airplane into a hard turn. For example, a 60-degree bank temporarily doubles the flying weight of an airplane. So, if the plane is in a hard turn, the stall speed may be 85 instead of 60. You must always consider factors that may force your plane to stall at a higher-than-expected speed.

Turn Coordinator

Located directly beneath the airspeed indicator, the turn coordinator is one of the more exotic instruments on your aircraft's control panel. The "ball" is an indication of your plane's flight path relative to its facing. A plane doesn't necessarily move in the direction of its nose; rudder inputs can point the nose to either side of the plane's actual flight path.

Think of the center of the horizontal bar as your plane's nose. It is indicated by the two vertical lines in the middle of the bar. If the ball is to the left of the two lines, that means your nose is pointing to the right of your plane's flight path. If you depress the left rudder pedal, you will bring the plane's nose in line with its flight path, which results in higher thrust efficiency and less stress to the airframe. Because you press the rudder pedal on the same side of the aircraft as the ball on the indicator, this is called "stepping on the ball."

Whenever the ball deviates from the centerline, step on the ball with the appropriate rudder pedal. This comes in very handy when banking the aircraft. The ball helps you apply just the right amount of rudder to bring your plane smoothly through the turn. Keep the ball centered in the turn coordinator as you complete your turn, and you'll conserve speed and altitude.

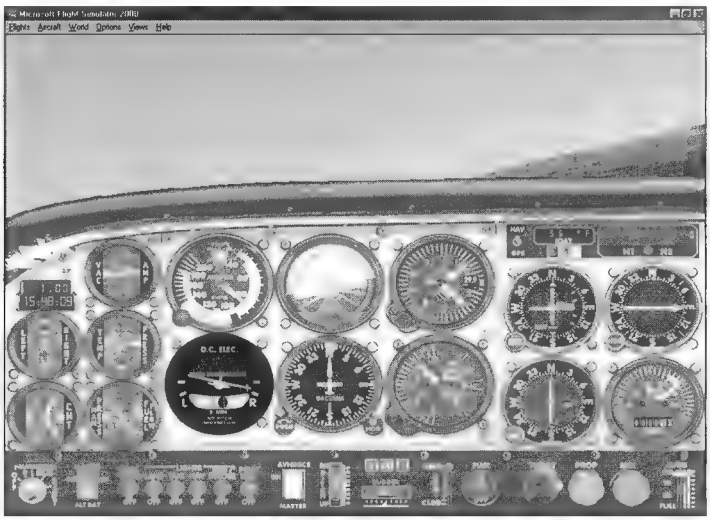


Figure 5-6
The turn coordinator displaying a slight right slip. Stepping on the right rudder would bring the nose in line with the flight path.

Attitude Indicator

The attitude indicator displays the roll and pitch of your aircraft. The indicator is divided into two hemispheres, one blue and the other brown. The blue represents the sky, and the brown is . . . yep, the ground. The line between the two is like the horizon, and thus the indicator is also called the "artificial horizon."

The appearance of the artificial horizon always corresponds to the real horizon in relation to your plane's nose. If you are flying straight and level, the artificial horizon will be level and centered halfway down the indicator. When you point your nose downward, the ground fills your window from the bottom up. So too with the artificial horizon, which shows the brown hemisphere filling up the display. If you dip your plane's right wing, the horizon seems to tilt outside, from lower left to upper right. The same thing happens to the artificial horizon indicator.

The attitude indicator is invaluable in low-visibility situations because it represents your plane's orientation relative to the

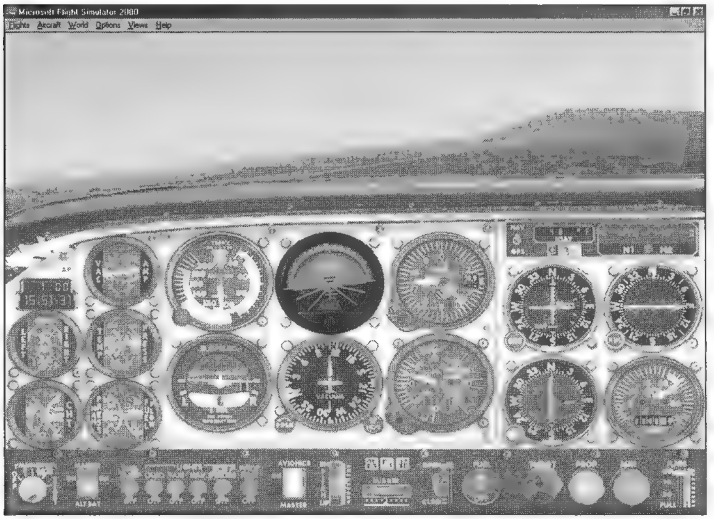


Figure 5-7
The attitude indicator shows a level pitch and a slight roll to the right.

ground. By keeping the line on the indicator level, you will fly relatively straight and level. Also, should you ever become disoriented during flight, you can trust this indicator to help you recover to level flight.

Heading Indicator

This indicator has many functions and even includes some controls. Many of your instrument navigation aids are incorporated into this indicator to help you to fly from one place to another without visual references. Finding your way around using only these instruments is covered in the theme flight chapters of this guide, where we take each plane on a theme flight and use various navigational aids. We'll just cover the features of the indicator itself here.

The dial is marked like a compass, and your current heading is represented by the marks at the top of the dial. Within the dial is a double-sided orange marker which reflects the position of the

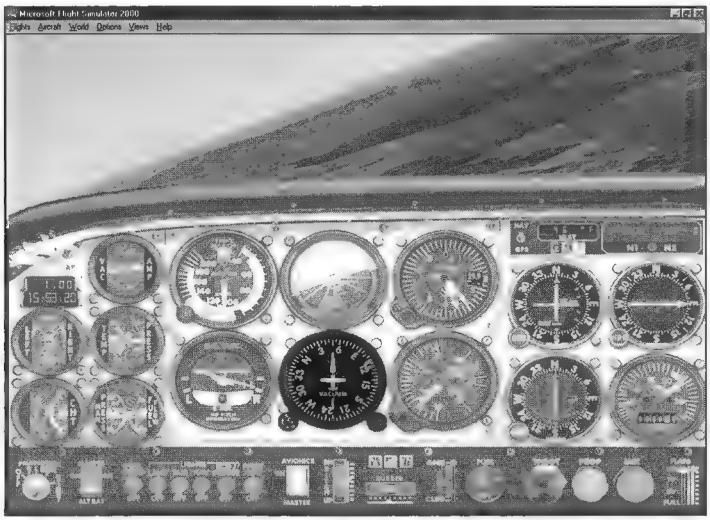


Figure 5-8
Our Cessna is in a right bank, and the heading indicator shows that we are moving toward a preset heading of 12 degrees.

TIP

The heading indicator is gyro-driven, meaning that it can wobble out of proper alignment. You should periodically adjust the indicator to match your magnetic compass. Simply click on the adjustment knob attached to the bottom left-hand side of the gauge.

heading bug setting knob, attached to the lower-right side of the gauge (hold the button down for fast adjustments). If you set the bug to a specific heading, when you engage the heading feature of your automatic pilot (see the radio stack section that follows), it will steer to and then maintain this course.

You can also adjust your heading for sight navigation, or to match the beacon you have selected with your NAV radio (described later in this chapter). When the arrow lines up, you are on the bearing you have dialed in.

Altimeter

The altimeter displays your altitude in feet. The indicator decides how high you are based on air pressure, which is really a measure of your altitude above sea level. Not all airports are as close to sea level as Honolulu International, so it is important to keep in mind that this is *not* the same as your altitude above ground level, or AGL. If you climb to 8,000 feet at SeaTac International, which is 429 feet above sea level and then fly to Mount Rainier, you may

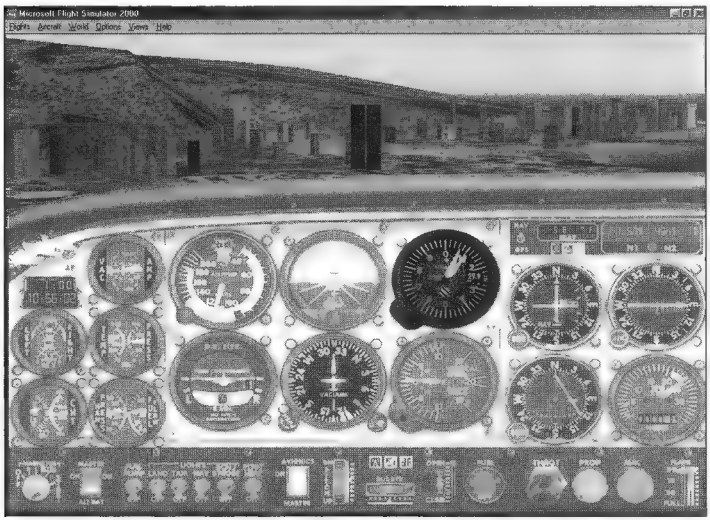


Figure 5-9
This altimeter shows an altitude of just over 1,000 feet above sea level. Because Honolulu International is only 13 feet above sea level, this happens to be a good approximation of our AGL (above ground level) height, too.

crash into a mountainside, even though your indicator says you're 8,000 feet high!

Vertical Speed Indicator

The VSI shows how fast you are climbing or descending in hundreds of feet per minute. When the needle points directly to the left (at 0) on the dial, your aircraft is maintaining its current altitude. If the needle moves clockwise from the 0 position, your plane is climbing; when it moves counter-clockwise, you are descending.

Beyond the Main Cluster

Although you can safely fly using only the six aforementioned gauges, even the Cessna's relatively small instrument panel is packed with other gauges, dials, and switches. The following sections explain these instruments. We begin with the small bank of gauges to the left of the main cluster.

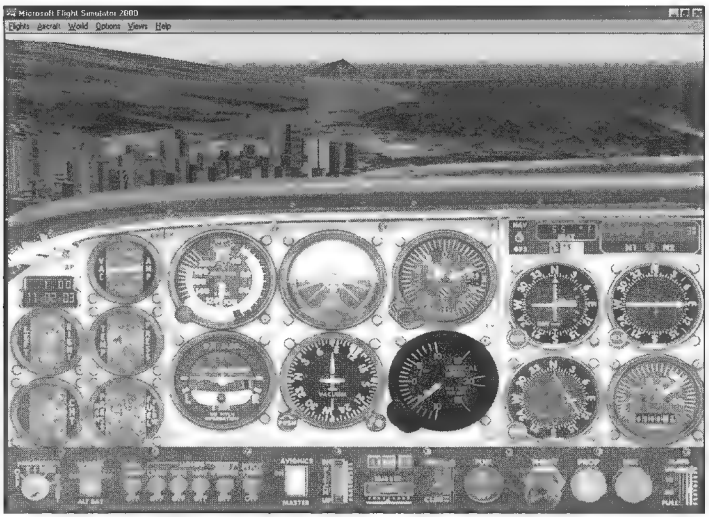


Figure 5-10
After cruising over Waikiki Beach, we dive down for a closer look at Diamondhead, and the vertical speed indicator displays a healthy descent rate of about 600 feet per minute.

Autopilot Master Switch

In the upper-left corner of the panel is the automatic master switch, which turns the automatic pilot on and off (a succession of loud beeps warns you when the AP is turned off). In its basic form, the automatic pilot acts as a cruise control, locking the plane into its current speed and maintaining level flight. However, on many planes, including the Cessna 182S, you can fine-tune the autopilot with the hold buttons on the AP console located at the bottom of your radio stack. The radio stack is pictured in Figure 5-11 to show its function in combination with the autopilot master switch. For additional explanations of the automatic pilot, see the following radio stack section.

Clock/Simulation Rate Indicator

Below the AP master switch is the clock/simulation rate indicator. The flight clock is an accurate timepiece, but it does not show time of day. Instead, it tracks the time elapsed since the beginning of

Figure 5-11
With the heading button engaged on the autopilot control panel (lower right), our Cessna automatically adjusts its flight path to 32 degrees, as programmed on the heading indicator.

Figure 5-12
Our brief tour over Honolulu has taken just over 11 minutes in real time, as displayed by the clock.

your flight, measured from your engine start. It is in all other ways identical to a standard clock.

Above the clock is the simulation rate indicator. This is a handy device known only to flight simmers, although real pilots would love to accelerate time to make up for a stubborn headwind. Click to the left of the decimal point to lower the simulation rate, or click to the right to increase the rate. Naturally, real time is an acceleration rate of 1.00.

Engine and Electrical Gauges

Aside from the clock/simulation rate indicator, the left-hand section of the Cessna 182S instrument panel is occupied by the engine gauges described below.

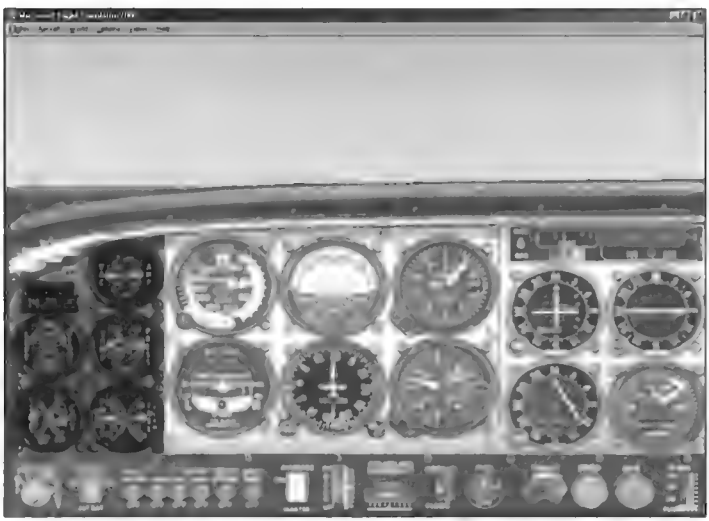


Figure 5-13
All engine gauges are conveniently located on the left side of the Cessna 182S instrument panel.

FUEL GAUGES

Most aircraft have right and left fuel tanks, which can operate independently of one another as a safety measure. Should one of the fuel tanks rupture or malfunction, the other tank still provides

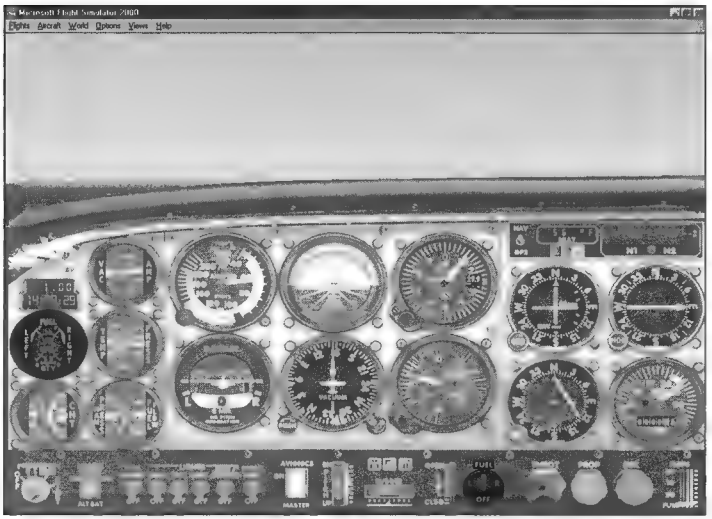


Figure 5-14
Both tanks are full as we climb away from Leeds airport in the U.K.

the engine with enough fuel to get to an alternate landing strip. On the Cessna 182S, you can switch between tanks or draw from both by using the fuel tank selector switch located along the bottom strip of the panel, just beneath the VSI.

EXHAUST GAS/CYLINDER HEAD TEMPERATURE GAUGES

Aircraft engines generate their power like all other conventional combustion engines. By mixing fuel, air, and a spark, they induce a small explosion that pushes a piston. The motion of the pistons in turn rotates a shaft to which a propeller is connected, providing thrust.

By injecting less fuel into the combustion chamber, you can cause a more violent explosion. This is called running a *lean* mixture to your engine (the needle on the EGT rises as you lean the mixture). Conversely, introducing more fuel into the chamber relative to the air produces a *rich* mixture (EGT needle drops), which burns cooler and less powerfully. All of this is also affected by the plane's altitude. Since air is thinner at higher altitudes, you would need a leaner mixture setting to provide the adequate ratio of fuel to air.

NOTE

You can change the amount of fuel in either or both of your tanks by clicking Aircraft, and then Fuel. More fuel will get you further, but it will make your plane more sluggish and slower to respond, too.

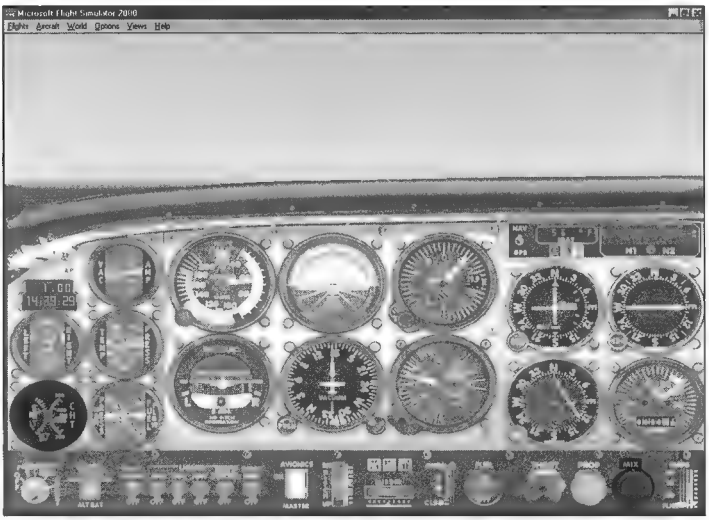


Figure 5-15
The EGT and CHT readouts share a single gauge just below the fuel indicators.

In order to get maximum range and performance from your aircraft, run your mixture as lean as possible, especially above 3,000 feet. You can change the mixture during flight by dragging the mixture control or by inputting the appropriate keyboard command. Just be careful not to run the engine(s) too hot and risk failure. The CHT monitors the temperatures of the cylinders in air-cooled engines, while the oil temperature gauge keeps tabs on, you guessed it, the oil temperature. Check these gauges often as you adjust your mixture settings, and keep them in the green zone.

SUCTION GAUGE AND AMMETER

The suction gauge monitors the vacuum pump that keeps the gyros in the attitude and heading indicators working properly. Normal operating range is 4.5-5.5 Hg. If the pump fails, your indicators will also cease functioning.

The ammeter occupies the right half of the gauge and measures the charge rate going from the alternator to the battery. If the electrical system is operating properly, the meter should hover

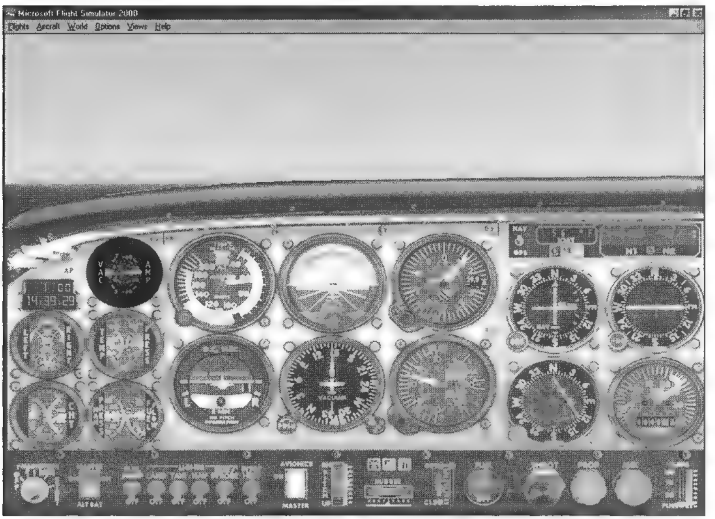


Figure 5-16
The suction gauge and ammeter share a single gauge just to the right of the clock.

near or just above 0. If the meter registers a constant discharge, you have problems.

OIL TEMPERATURE/OIL PRESSURE GAUGE

Your aircraft's oil gauges are really only of interest if something is wrong. If your oil pressure or temperature exceed the green zone on these gauges, you are probably overworking your engine. Throttle back, or enrich your fuel/air mixture with the controls described next to bring your oil back into an acceptable range.

MANIFOLD PRESSURE GAUGE/FUEL FLOW INDICATOR

The manifold pressure gauge measures the air being forced through the engine induction system. Because this reading is tied to throttle input, the needle swings up during takeoff at full throttle, as it does on the fuel flow indicator, which monitors the flow of the fuel injection system. In combination, these gauges tell you if your engine is breathing freely and receiving sufficient fuel flow. At 30,000 feet, it is the only acceptable condition for your fuel lines.

Figure 5-17
Look for the oil temperature/oil pressure gauges beneath the ammeter.

Figure 5-18
At full throttle on takeoff, fuel flow nears the top of the range, while manifold pressure lags just behind.

Navigation and Communications +1

The right-hand section of the Cessna 182S instrument panel is devoted to navigational electronics, including a bank of radios that pops up when you press the radio stack button. There is also a tachometer that looks out of place in the lower-right corner (that's our +1).

DISTANCE MEASURING EQUIPMENT

At the top of the instrument panel on the right side, you find the DME, which measures the slant distance from the airplane's receiver when it is tuned into the VOR (very high-frequency omni-directional range) or ILS (instrument landing system) station on the ground. Three lights at the top of the radio stack are marked O, M, and I. These indicators illuminate to the accompaniment of an audible tone when you pass over the respective markers on approach to an airport. "O" stands for the outer marker, which

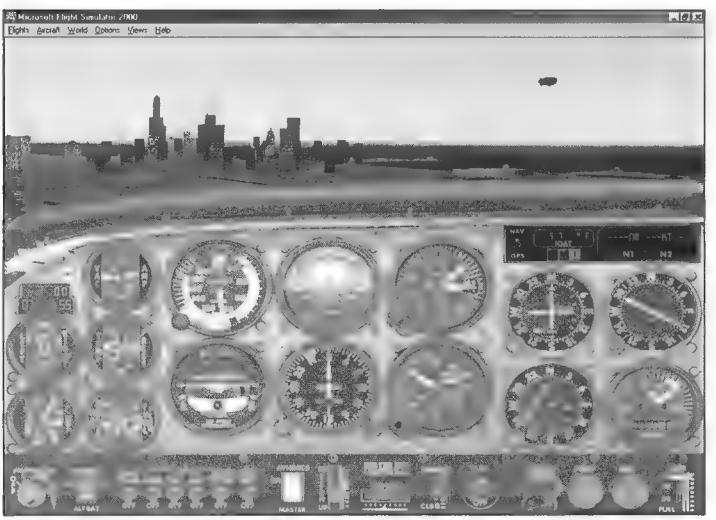


Figure 5-19
The DME panel is visible in normal view here, and when the radio stack is displayed.

you pass over at five miles outside of an airport. The beacon transmits "- - -" in Morse code. "M" means middle marker beacon, which is about 3,500 feet from the runway. The beacon transmits a ". - . –" signal in Morse code. Finally, "I" is the inner marker located between the middle marker and the beginning of the runway. When this final marker is reached, you receive a Morse code transmission of ". . . ."

The marker indicators are of primary value to instrument landings (ILS) when you cannot see the runway. With experience, by combining the information on your DME, altimeter, and beacon indicators, you'll know right were you are in your landing approach even without looking out the window. See chapter 6 for detailed instructions on using the DME during ILS approaches.

VOR 1 INDICATOR

The VOR 1 indicator, or OBI (omnibearing indicator) displays your position as it relates to the VOR station set in the NAV 1 radio, and the radial, selected with the OBS button. Navigating

Figure 5-20
According to the upside-down white triangle at the bottom of the VOR 1 display, we are flying away from the VOR station. Based on the position of the needle, we must turn right to intercept the path.

with VOR beacons is explained in detail in chapter 6, but the basic steps are as follows:

1. Using the NAV 1 radio, tune into the desired VOR frequency (for example, the VOR frequency for Brunswick, Maine is 115.20).
2. Click on the OBS button until the needle centers and the display indicates a TO flag (upward pointing triangle).
3. Adjust your current heading to the course displayed on the VOR.
4. When you are over the VOR, the flag changes to red and white stripes.

ADF INDICATOR

The Automatic Direction Finder points toward the NDB, or ground nondirectional beacon to which the ADF radio is tuned. The ADF needle always points in the direction of the NDB. Simply turn the airplane until the needle is pointing at 0, which means

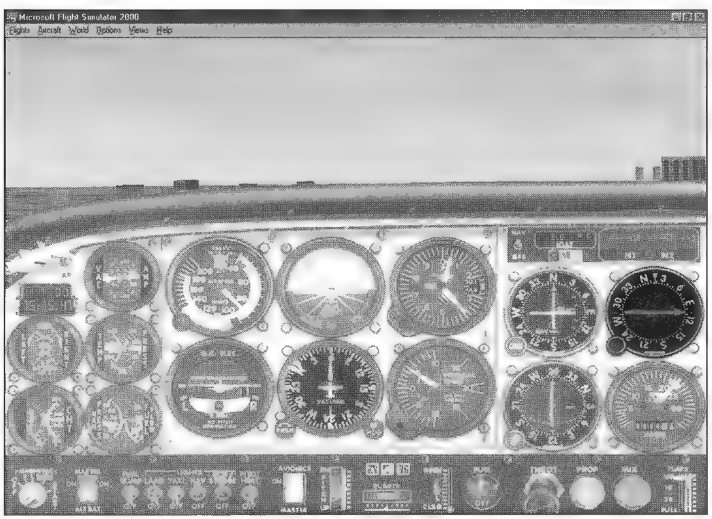


Figure 5-21
Automatic direction finder

that the NDB is in front of you. It is important to remember that the ADF displays only a location, rather than a true magnetic heading.

VOR 2 INDICATOR

This is your second VOR indicator, tuned to the NAV 2 radio and the radial course selected with the attached OBS button. For more information, see the previous description for VOR 1.

Figure 5-22
VOR2 Indicator

TACHOMETER

This indicator is just like the tachometer in your car. It shows the revolutions per minute, in hundreds, of your engine. Be careful not to redline your engine(s) for extended periods of time, or you might induce an engine failure. At several thousand feet in the air, that can be scary.

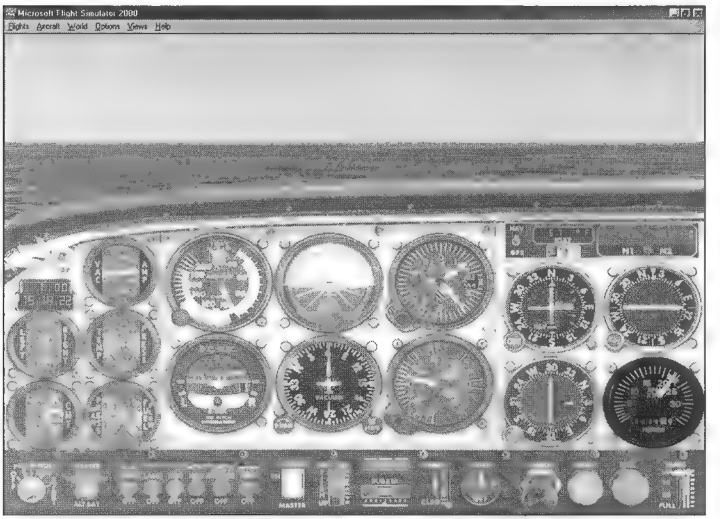


Figure 5-23
The engine rpm indicator shows this plane is turning about 2,400 rpm.

The Radio Stack

The radio stack is hidden from view on the Cessna 182S until you click the Display/Hide Radio Stack button located just above the rudder trim dial at the bottom center of the panel. Modern aircraft include radios not only for communicating by voice, but also for use as navigation and identification aids. On the Cessna, the stack includes six different consoles. From top to bottom, they are: COM 1/NAV 1, COM 2/NAV 2, ADF (automatic direction finder), DME (distance measuring equipment), transponder, and autopilot.

All aviation radio frequencies are standardized and documented so pilots may refer to them at any time for communication or navigation. For example, you will always be able to find your friendly neighborhood SeaTac tower at 119.90. A handy listing of aviation radio frequencies for popular airports is located in Appendix B of this Guide.

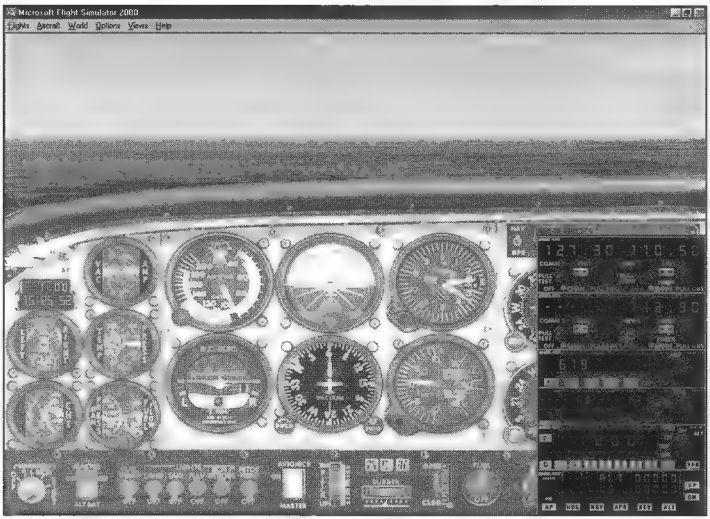


Figure 5-24
The radio stack.

COM 1/NAV 1 Radios

The COM 1/NAV 1 radios are side-by-side at the top of the radio stack. The COM 1 radio is used for all verbal interactions with controllers. You can only tune into one COM radio frequency at a time, but that's OK because you can only have one conversation at a time anyway. However, you can store an additional frequency and switch between the two numbers by clicking the standby button.

To tune the radio, position the cursor over the frequency. Depending on where you place the cursor, a + or – sign appears. Click again to either raise or lower the numbers, depending on the visible sign.

The COM radio receives ATIS (Automatic Terminal Information Service) broadcasts for airports with operating control towers. The frequency range is 118.0-135.975 MHz.

The NAV 1 radio is tuned in a similar fashion to COM 1. However, it is used to measure your bearing from the known positions

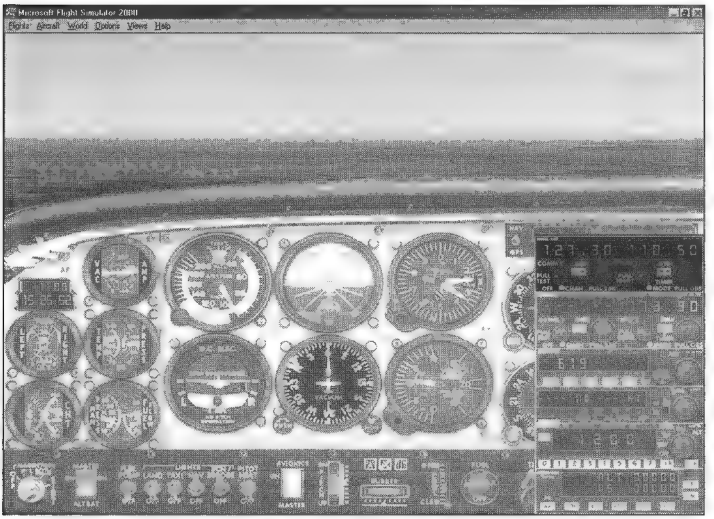


Figure 5-25
COM1/NAV1 Radio

of navigation beacons. By tuning your NAV radio to the frequency of one of these very high-frequency omnidirectional range (VOR) beacons, you can use your VOR indicator in the primary instrument cluster to navigate in fair weather or foul. For more information, see the earlier section on the VOR indicator. Also, for detailed navigational tips, see chapter 6.

COM 2/NAV 2 RADIO

The COM 2 radio is not active in the Cessna 182S. Like NAV 1, the NAV 2 radio is used to tune in VOR beacons in conjunction with the VOR 2 indicator. The NAV 2 radio can be tuned to the frequency of ILS beacons to aid in instrument landings. Note that an airstrip may feature only a localizer signal (horizontal beam), which gives you the airport's location and your bearing to it, but does not provide a glideslope (vertical beam). For more information on ILS navigation, see chapter 6.

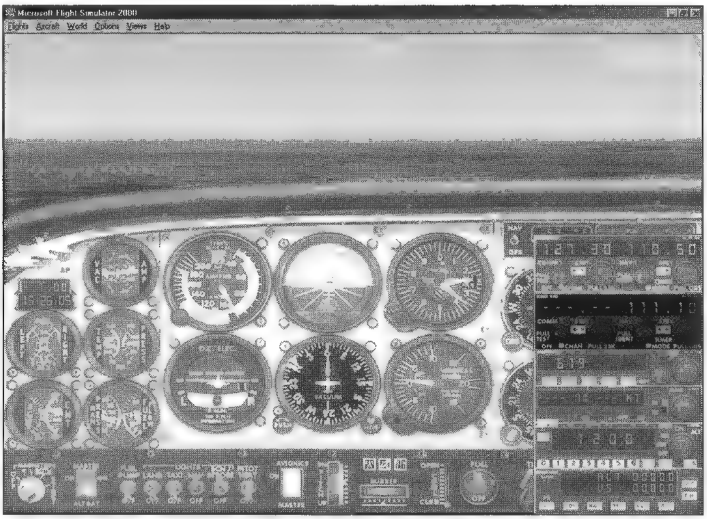


Figure 5-26
On the NAV 2 radio, 111.10 is the ILS frequency of runway 34 at Denver International.

AUTOMATIC DIRECTION FINDER

The ADF radio allows you to set the NDB frequency and use the ADF indicator (see previously in this chapter) to find the desired location.

DISTANCE MEASURING EQUIPMENT

This indicator, called the DME for short, tells you the distance to the VOR beacon tuned in on the NAV radio. By combining the bearing to the beacon with the distance measure, you can deduce your exact location. This powerful ability is an important part of instrument flying, during which you may not be able to see familiar landmarks to help you orient as you fly.

Figure 5-27
After locking into frequency 222 on the ADF radio (NDB signal for Charlevoix Municipal Airport), we adjust our heading, and soon the Charlevoix control tower comes into view.

Figure 5-28
The DME shows 5.7 nautical miles to the beacon.

TRANSPONDER

The transponder automatically transmits basic information about your aircraft to air traffic control in a coded burst. This transmission is called a "squawk," so named because it is like the distinctive call of a bird. All aircraft flying under VFR squawk the identity 1200, signifying their status. If you choose to register an IFR flight, you will be required to squawk a unique identification code that help ATC expedite you to your final destination.

To set your transponder code, highlight the numbers on the display, and then type in the desired code. The left knob selects between the on and off positions, and the button on the right side of the radio transmits your transponder code manually.

Figure 5-29
This transponder is squawking 1200, the universal code for aircraft flying under visual flight rules (VFR).

AUTOPILOT

The autopilot can be set to maintain heading or altitude, follow a VOR radial, or track an ILS localizer and glideslope. Turn on the autopilot by clicking the AP master switch in the upper-left corner of the instrument panel, or by clicking the AP button on the autopilot console, where you can also customize the controls. Here's what all the buttons do:

HDG (heading): Follow the setting of the heading bug on the heading indicator.

NAV (navigation hold): Click to track inbound or outbound to a VOR beacon, or to follow a GPS course when the NAV/GPS switch is set for NAV mode.

APR (approach hold): Click this button on an ILS approach to hold your airplane on the localizer and glideslope signals.

NOTE

To adjust the settings directly, click on the numerical readouts and click – or + to change the values for altitude or vertical speed (VSI hold switch must be engaged).

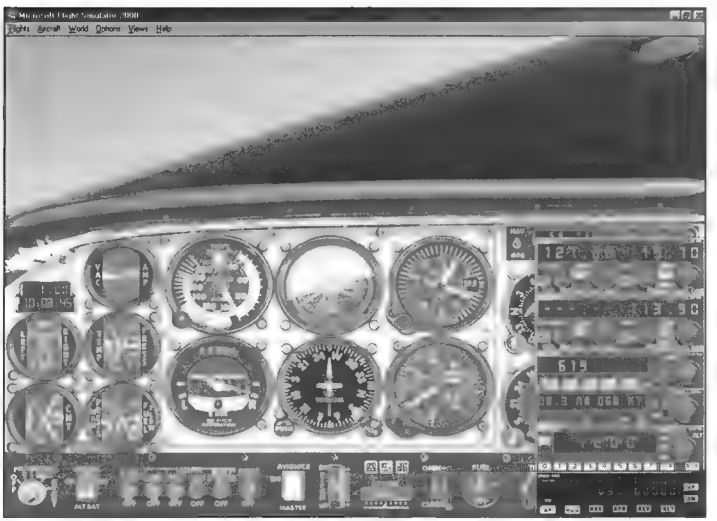


Figure 5-30
After clicking the HDG button on the autopilot console, our Cessna adjusts to the position marked by the heading bug on the heading indicator.

REV (backcourse hold switch): During a backcourse approach, click this button to hold your plane on the backcourse localizer signal.

ALT (Altitude Hold): Click button to maintain the specified altitude.

Engine Controls and Secondary Control Instruments

These instruments and controls are located underneath the main banks of gauges. They include your in–flight engine controls and gauges that display the status of your secondary flight controls. The following sections mirror the controls on the Cessna 182S, going from left to right across the bottom of the panel.

Figure 5-31
Engine controls and secondary instruments.

Figure 5-32
A Cessna 182S takes off from Meigs, Chicago in the wee morning hours.

MAGNETOS

By default, the engine is already running on *MFS2000* missions. However, you can shut down and restart at any time (preferably not while flying) by clicking on the ignition key in the lower-left corner of the panel.

MASTER SWITCH

Before starting the ignition, make sure that this switch is in the ON position to activate the airplane's electrical system.

SWITCH BANK

The selection of small switches varies from plane to plane. In most cases, these switches include external lights. The Cessna 182S has these controls:

Fuel Pump: A supplemental electric pump that is not essential, but is recommended on some airplanes to provide back-up during takeoff.

Landing Lights: Single beacon on the starboard wing.

Taxi Lights: Same as landing lights.

Navigation Lights: Red (left or port) and green (right or starboard) wingtip navigation lights, and white taillight.

BCN/Strobe: Flashing red light on the top of the tail.

PITOT HEAT SWITCH

This switch toggles the pitot tube heating element on and off. This should be used when temperatures are near freezing or when you are flying in heavy clouds or rain. A blocked pitot tube will prevent the airspeed indicator from displaying accurate readings.

AVIONICS MASTER

Click this switch to turn all radios on and off. You must still use the radio stack button to display all of the communications consoles.

ELEVATOR (PITCH) TRIM AND POSITION INDICATOR

Use the elevator trim to make fine adjustments to the airplane's pitch (nose up or nose down).

RUDDER (YAW) TRIM AND POSITION INDICATOR

Use the rudder trim to make fine adjustments to the rudder position to compensate for yawing (rotation on the vertical axis).

DISPLAY BUTTONS

Above the rudder trim are three buttons that toggle instruments hidden by default. From left to right, the controls include radio stack, GPS (global positioning system), and compass.

COWL

Use this switch to open or close the cowl flaps to allow airflow to the engine. When in doubt, open the cowl flaps on takeoff and during the initial climb.

FUEL TANK SELECTOR

Use switch to select left, right, or both fuel tanks.

THROTTLE LEVER

This lever controls your engine's throttle setting. Pushing the knob into the dash increases the rpms of your engine to provide more thrust. As mentioned previously, be careful not to "red line" your engines for extended periods, or you might experience an engine failure.

PROP

Use this control to adjust the engine rpm setting. Consult the *MFS2000* manual for individual airplane settings.

MIXTURE LEVER

Adjust this button in or out to change the air/fuel ratio. This setting affects fuel consumption and power. For more information, see earlier EGT gauge section.

Figure 5-33
A Cessna 182S on final approach with flaps fully extended.

Flaps Gauge

This indicator displays the status of your flaps. At the top of the gauge (UP) is the 0° mark, indicating your flaps are up, or retracted. The bottom of the gauge reads FULL, which represents 30°, or full flaps deployment.

When cruising, your flaps should always be fully retracted to maximize your speed and prevent damage to your flaps. At high speeds, the pressure on the flaps can be so great that the hydraulics that maintain their position can fail. After that, you'll have no control over your flaps at all, and you lose a significant amount of lift. Such a failure will make your landing especially uncomfortable!

CHAPTER

6

Navigation and Communication

You're probably accustomed to referring to directions using north, east, south, and west. Rather than using these common terms, pilots express directions in numbers. The compass on the instrument panel shows 360 degrees, which represents a full circle with 360 degrees and 0 degrees sharing the top marker (due north). Specific numbers on the compass correspond to the normal words for directions. A heading of 0 degrees means you are heading due north. A heading of 90 degrees means you are heading due east, and 45 degrees is northeast. Being able to recognize that a heading of 270 degrees is due west, for example, will help you greatly when it comes to navigating using nothing more than a map and compass.

When driving, you might use traffic lights, stores, and other neighborhood landmarks when giving directions. Pilots take a similar approach in the air. Perhaps it isn't quite the same as "head west until you see the mountains, turn left at the second cactus, turn right at the pond, and you're there," but pilots do look for specific landmarks when using charts and compasses. These tools tell them whether or not they are still on course. Pilots call this seat-of-the-pants form of navigation "pilotage." It's a valuable skill to learn, and it is in the most common form of private pilot navigation. When flying using pilotage, a pilot is deemed to be operating under visual flight rules (VFR).

NOTE

In real aircraft, pilots constantly scan the ground looking for visual landmarks. This can be a challenge, given the limited area of glass in many cockpits. In *MFS2000* you have a number of views that allow you to "leave" the cockpit and gain a much better perspective than real pilots could ever achieve. Configure your controller or keyboard before flying to enable easy access to every viewing angle, including special exterior views like Tower, Spot Plane, and Top Down.

VFR NAVIGATION

Most private pilots have their VFR qualifications only, meaning they can fly so long as there is high visibility and there are identifiable points of reference along their flight path. VFR-rated pilots cannot fly over open water and may be grounded when visibility conditions obscure ground landmarks. For many pilots, neither of those situations sounds appealing in the first place, so a VFR rating is just fine with them!

You may have heard the term, "dead reckoning" before. "Dead" is actually a shortened and slang form of the word *deducted*. Deducted reckoning describes navigation by using the simplest of calculations: what direction leads to your destination,

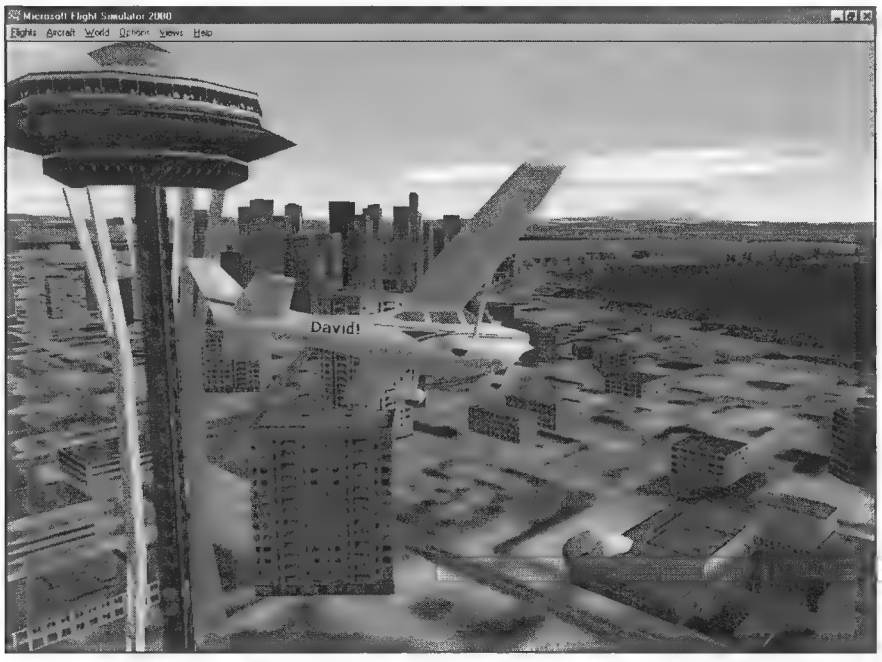


Figure 6-1
Taking a left at the Seattle Space Needle.

and how far it is in that direction. Because speed is a measure of distance over time, you can figure out how *long* you need to fly in the proper direction at a certain speed in order to reach your destination. With your magnetic compass, one of the simplest instruments in your plane, you can maintain the proper heading, and thus fly just about anywhere without having to get into the fancy world of NAV radios, VORs, and ADIs.

Everyone would be using dead reckoning if it was perfectly reliable, but it isn't. An aircraft flying through the air is not touching the ground obviously. What is not so obvious is the fact that this changes the *relative* frame of reference of the aircraft. Since it is not tied to the ground, it is now moving relative to the air around it, and not the ground itself.

Say for example that you are sitting in a seat riding in a train. Relative to the frame of reference around you, you are sitting still. Relative to the world outside, however, you are thundering along at 50 miles per hour. If you stand up and walk to the cafe car, now you are moving at a walking pace relative to the train, and at, say, 51 miles per hour relative to the station.

All this talk of relativity boils down to one essential point for pilots: your airspeed and flight heading are not necessarily correct relative to the ground. Let's say the wind is blowing at 25 knots toward the northwest. If you head north at an indicated airspeed of 120 knots, you'd expect to travel 120 nautical miles in an hour, and end up due north of the place you started from. The wind will push you northward and westward over the entire trip, however, and you will eventually find yourself a full 25 nautical miles northwest of your plotted destination after an hour of flight, all because of the wind! Pilots therefore refer to two distinct airspeeds: *indicated airspeed*, which is a measure of your speed relative to the air around you, and *ground speed* or *true airspeed*, which is a measure of your actual movement relative to the ground. Because of the difference between indicated and true airspeeds, dead reckoning is not a reliable means of navigating over extended distances.

Pilotage is a more reliable form of visual navigation. Using a compass in conjunction with landmarks such as interstate highways, distinct natural terrain features, and man-made structures,

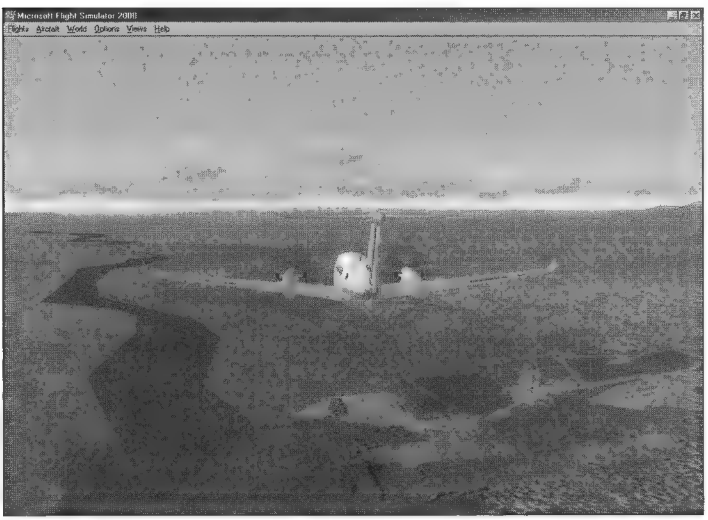


Figure 6-2
Interstate highways are an excellent means of visual navigation. Here, we follow I-15 through the desert toward Las Vegas.

pilots can figure out where they are, and where they are headed. Since these landmarks don't move regardless of how much wind there is, they are a reliable means of navigation. Urban flights are often made without all but a cursory glance at a compass, as pilots fly from one familiar landmark to another. Private pilots even fly commutes between cities merely by shadowing a major highway. Used in conjunction with dead reckoning, pilotage can be used for longer trips across land. Out in the open ocean or in desolate regions however, you'll find no handy landmarks. If your travels are going to take you over this sort of terrain, it's time to get your IFR (instrument flight rules) certification.

IFR NAVIGATION

IFR flying is an altogether different kind of adventure than VFR. For the most part, you fly "head-down," meaning you paying far more attention to your instrument panel than to whatever is going on outside your cockpit windows. Quite often under IFR condi-

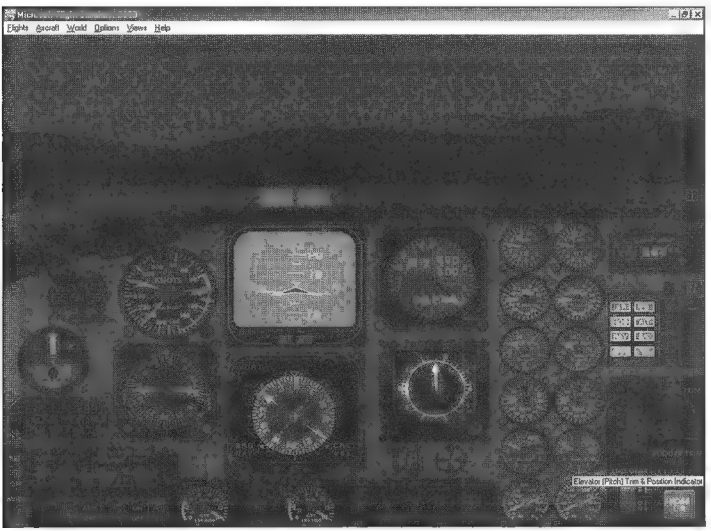


Figure 6-3
Nighttime is the right time for a little instrument navigation.

tions, your instruments are your *only* means of navigation, as the world outside can be completely obscured by fog, clouds, precipitation, or just plain darkness. Once you are an adept IFR pilot, however, you'll be completely comfortable in these situations.

All IFR flight is centered on one concept: the VOR (very high frequency omnidirectional range) beacon. The *Microsoft Flight Simulator 2000* manual has a good tutorial and documentary section on VORs, but we expand upon that information in Chapter 7—Qualifying Flights, and in our exclusive challenge flights offered in chapters 8 through 15. In the next section, you'll learn how your navigation instruments work and what to expect from them.

Your VOR and You

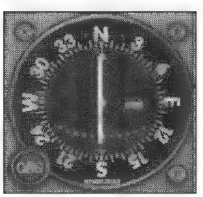


Figure 6-4
The VOR indicator in the Cessna Skylane.

A VOR beacon is a high-tech transmission station that sends out a special coded radio signal on a specific, documented channel. By tuning into the frequency of a given beacon, you can get information about your position relative to the transmission tower. Most modern aircraft have special radios called navigation radios (or just NAV radios for short) to do this. Most planes so equipped have two such radios. To differentiate between the two, they are named NAV 1 and NAV 2.

A VOR helps you to navigate by telling you where you are in relation to its fixed position. As mentioned in chapter 5, you receive bearing information, which tells you that you're somewhere along a specific line away from the station, and you receive distance information, which provides your exact distance from the station. Combined, these two pieces of information put you at a specific point along a known line, which boils down to a known location. When you are tuned to a given VOR, this information is constantly updated. Now you just have to learn how to actually retrieve and process this data.

Show Me the Needle!

Your VOR indicator is the primary means of putting instrument navigation to work for you. The function of the gauge is described in chapter 5; here, we examine how to actually use it. First, you

must know the radio frequency of the VOR you'll be using so you can tune your NAV radio. Unfortunately, *Microsoft Flight Simulator 2000* does not provide its pilots with easy access to a list of navigation frequencies. However, you can go to the World menu, and click Map View to display a customizable map of your current course. It is a roundabout method of obtaining your VORs, but *most* of them are there. For airports that have their own VORs (many airports use nearby VORs rather than their own), you can double click at the center of the runways to display a Facility Information screen; this contains the VOR frequency and other valuable data that we will discuss later.

You can use the *MFS2000* Flight Planner to generate a rigid IFR flight plan, but the plan only lists frequencies for the waypoint beacons and not your final destination.

A second option is better; in Appendix B of this guide is a handy list of approximately 4,000 airports, including VORs, NDBs (more on that later) and in many cases, ILS frequencies, courses, and runways.

If neither of these options fills the bill, your only choice is to fly into one of the few destinations whose navigation and approach data is listed in the back of your game manual on Jeppesen Sim Charts. The bottom line is, you may need to do a little searching to find critical navigational data.

If you do find a frequency that you'd like to tune into, dial it into your NAV 1 radio using the com stack as described in chapter 5. You can use a VOR station as a point of origin, a destination, a waypoint, or even as a means of triangulating your position without being on an intercepting flight path at all.

To head toward a VOR beacon that you've tuned in, take a look at your VOR indicator. The white vertical needle is called the course deviation indicator (CDI). The CDI is just like the spoke of a wheel, with the hub being the VOR beacon. The spokes, called "radials," all correspond to a direction from the station. If the CDI slants down and to the right, that means you are to the left of the radial you have dialed in. Likewise, a needle to the left of center means you are to the right of the radial. For now, just use the OBS knob (omnibearing selector) to adjust the needle until it points straight up and down.

TIP

This guide contains an invaluable resource in Appendix B: Airport Information. Although we could not list all 20,000 airports in the game, appendix B covers over 4,000 of the most commonly used airports, listing COM, NAV, and ILS frequencies, identifiers (these abbreviations will help you find information on the game maps), and important runway information (length and number/orientation). Without these numbers, you'd have no way of fully using your navigational instruments or even talking to the tower!

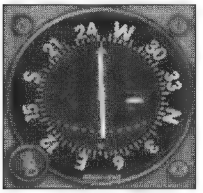


Figure 6-5
To fly directly to or away from a VOR station, simply dial the OBS knob until the CDI needle is centered and follow that heading.

The heading indicated at the top of the VOR indicator is the direction that you'd have to face in order to be going either directly toward or directly away from the station. Normally, a glance at the indicator flag located right of center would tell you whether it was reading TO or FROM the station, but the VORs in *MFS2000* are very stingy with that sort of information. Instead, the indicator always displays a white and red flag on its face, which means that you are neither going TO or FROM a VOR station. Obviously, this is not accurate.

Don't worry; the information is there, but you need to look a little closer at the small, flattened triangle at the bottom of the face. When it is pointed up, you are going *to* the VOR, and when it is pointed down, you are moving away. Despite this display glitch, you would still dial in the desired VOR, and then turn the airplane to match the heading underneath the index needle at the top of the VOR indicator.

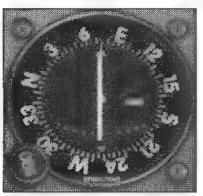


Figure 6-6
On a working indicator, the little striped flag on the right of the VOR indicator would either display the word "TO" or "FROM."

You can supplement the partially functioning VOR directional arrows by watching your DME indicator. If the distance is dropping on the digital display, you're flying toward the VOR. If the digital display is locked on 99M, you are moving away from the VOR. If this is the case turn 180 degrees to intercept the VOR station. Adjust the needle again, and then match your course to the index one more time. Once you come onto course, you will be successfully heading directly toward or away from the VOR station.

ILS Approaches

Sometimes, you not only want to fly directly toward a VOR station, but you also wish to approach on a particular heading. This is especially important for landing at an airport, because runways work best when you use their long axis (study the 737 section in Chapter 7—Qualifying Flights, for step-by-step instruction, courtesy of American Airlines First Officer Hank Stanley). By approaching on the exact heading that the runway is situated along, you can line yourself up for a landing while you are still miles away from the airport. To accomplish a vectored approach like this, you must adjust the plane's position instead of adjusting the VOR needle in order to line it up with the runway.

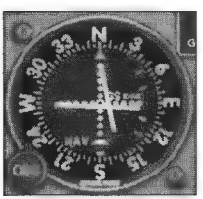


Figure 6-7
You must fly to the right to intercept this runway radial.

First, you must know in which direction the VOR beacon lies, so perform the procedure previously described in Show Me the Needle. When you are headed TO, dial the needle to index the heading of the runway you wish to land on. If you are landing on Runway 9, dial in a heading of due east on the VOR. Your needle is now probably pushed over to one side, meaning you are either to the left or right side of the designated radial. Turn your plane's nose toward the bottom of the needle, about 30 degrees off your original course if you are about 20 miles away. Make a wider turn if you are closer to the needle, and a smaller one if you are farther away. Doing this will help you to intercept the radial about 5 miles away from the airport.

If you are tuned to an ILS frequency instead of a mere VOR, your VOR will also display useful information with the horizontal white needle. This line represents the runway *glideslope*. The glideslope is an imaginary line that starts at the tip of the runway and extends up into the air. The path of this line is the optimum approach lane for executing a safe landing on the runway. If you were to fly all the way into an airport keeping the glideslope and CDI needles perfectly centered on your VOR indicator, you would execute a landing right on the sweet spot of the runway. If the glideslope needle drifts above the centerline, you are below the approach path, and you should climb by powering up. If you drift high, reduce power to settle down into the glideslope. Finally,

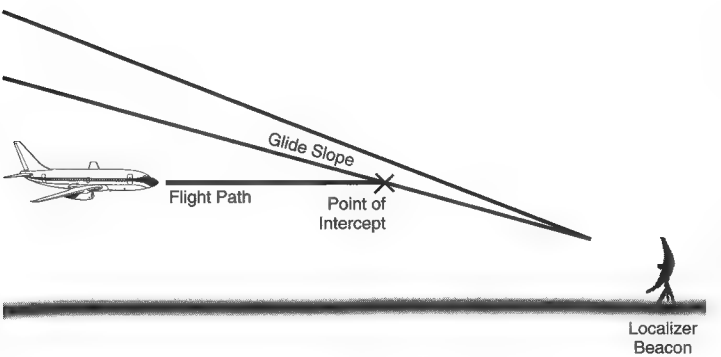


Figure 6-8
If you're too low, wait until you intercept the glide slope and then work on matching your descent rate by adjusting the throttle.

NOTE

Runway identifiers, such as 9R or 14L, correspond to the actual heading and location. The R or L tells you that there are two parallel runways. For example, runway 28R at San Francisco International Airport has an actual heading of 282 degrees, hence "28." The R signifies "right," and there are usually considerations for landing at left or right runways, even though they are parallel. For example, one runway may be longer and wider, and better suited for larger commercial aircraft.

CAUTION

In crosswind conditions, you won't actually be able to fly the runway heading, because the wind will keep blowing you off your line. See chapter 10 for a tutorial flight that specifically covers crosswinds.

maintain a course that matches the runway heading to put your plane down right on the money.

COMMUNICATION IS THE KEY

At a busy airport, dozens of planes at a time may all be vying for the same airspace and runway clearance. You can imagine what a nightmare would occur if pilots just decided to land wherever and whenever they chose. To avoid collisions and other problems, planes take off and land in an organized fashion that is coordinated by air traffic controllers and well-established approach routes called "patterns." Patterns come in a few flavors, the most common of which are standard traffic patterns and holding patterns.

In *Microsoft Flight Simulator 2000*, you have the freedom to land and depart in whatever fashion you choose. The air traffic controllers won't actually direct you into holding patterns or steer you clear of the flight paths of other airplanes, but the tower will talk to you, and after a while you may even find yourself respond-

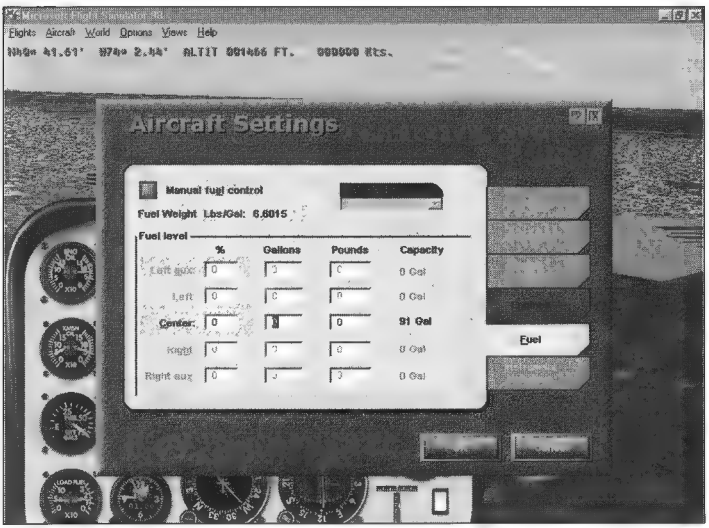


Figure 6-9
Failure to fly in the standard traffic pattern in a real plane can get you into all sorts of trouble.

The Landing Pattern

You've certainly heard pilots refer to "entering the pattern" as they prepare to land at an airport. Landing patterns are established paths of movement through the sky that keep all the planes around an airport flying in an orderly and safe manner. Patterns circle the airport, and the first thing you need to know is whether the traffic is circling clockwise or counterclockwise. "Right traffic" describes clockwise movement around the airport. It's called right traffic because the airport is always to your right as you circle in a clockwise direction. Conversely, left traffic means a counterclockwise rotation, where the airport is always to your left.

The pattern is broken up into several "legs," each of which describes a stage of your approach. The first stage is the crosswind leg, which is flown perpendicular to the runway at the end opposite from where you'll eventually touch down. Next, you turn onto the downwind leg, which is parallel to the runway. If you're in left traffic, you'll be making a left turn to get onto the downwind leg. Stay about 5 miles out from the airport as you go around on your approach legs. After you are 5 miles past the landing end of the runway, turn again until you are perpendicular to the runway; this is the base leg. The base leg is shorter than the other legs because you'll only fly halfway as far as the other legs—until the runway is directly abeam of your plane. Turn toward the airport to start your final approach leg. You will be lined up and ready to land.

ing. The following section is an explanation of how to talk to the tower and how to get the tower to talk back.

Talking the Talk

"Honolulu approach, Microsoft Flight Simulator niner-five Whiskey, two zero miles south, inbound to Honolulu International with information Bravo." This is what you might say if you were

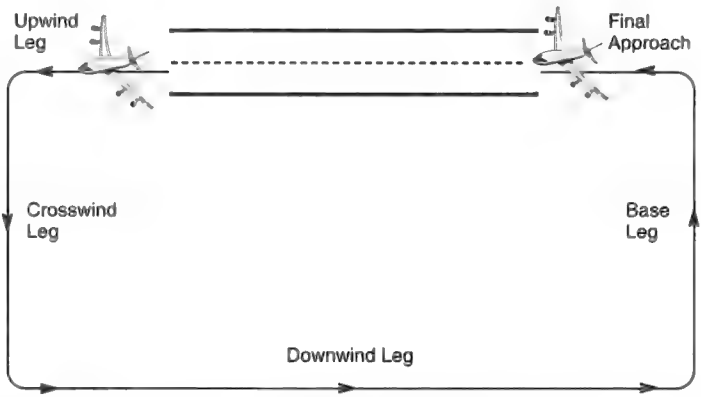


Figure 6-10
The landing pattern is a pattern that all airplanes fly when approaching an airport.

Figure 6-11
This Mooney is turning onto final approach from its base leg. Notice it's not quite lined up with the runway as it begins its bank. By the time the turn is completed, it will be right on the money.

20 miles south of Honolulu International Airport, and the last ATIS message you received was Bravo. Notice how the numbers are always spoken one digit at a time to avoid miscommunications, such as hearing "15" when the tower said "50."

Figure 6-12
On finals at Honolulu.

In general, your messages to the tower can be broken down into the following parts:

1. Whom you are addressing
2. Who you are
3. What your location is
4. What you want to do

A Sample Dialogue

Communication in *Microsoft Flight Simulator 2000* is limited to recorded ATIS transmissions (more on that later). You cannot request clearances to take off and land, so there is no live interaction between you and the tower. The following dialogue is broken up into what a real dialogue might sound like.

Normally, you would dial your COM radio to the proper tower frequency. If you are taxiing out to or in from the runway, you must contact ground control for taxi instructions. Takeoff and landing are handled by the tower, which has a different frequency.

Airports also have an automated message playing on the ATIS channel. You must know the COM frequencies of the airport you are communicating with in order to tune your radio, but since there is no interaction with the tower in *MFS2000*, this information is not provided.

GETTING TAKEOFF CLEARANCE

Pilot: *Meigs Tower, Mooney four-two-four ready for takeoff, runway three-six.*

Tower: *Mooney four-two-four, hold short of runway three-six, landing traffic.*

Pilot: *Roger tower, Mooney four-two-four, holding short runway three-six.*

Here, we requested takeoff clearance and were told to hold short, which means the runway isn't clear yet—in this case, due to another airplane currently landing on that runway. Therefore, we have been directed to wait in position just off the end of the runway. Pilots are required to repeat all instructions back to the

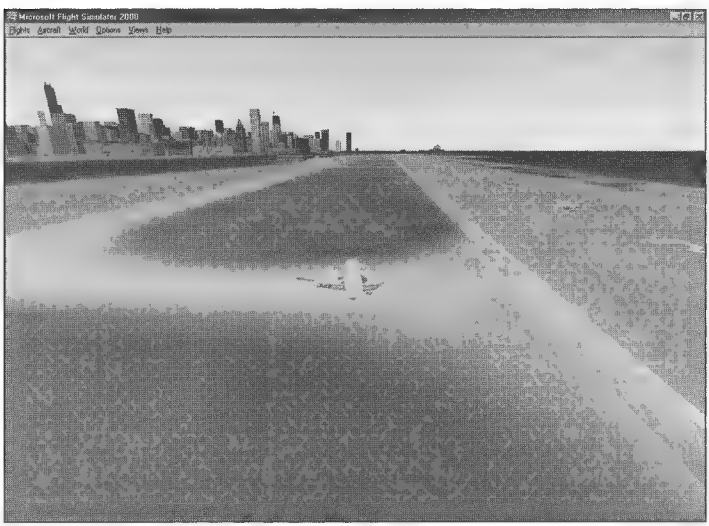


Figure 6-13
Holding short at Meigs Field's Runway 36.

tower to ensure they have understood so as to avoid accidents. So, we repeat that information to the tower and await further instructions.

GETTING LANDING CLEARANCE

Pilot: *Meigs Tower, Mooney four-two-four, one-five miles northwest, landing.*

Tower: *Mooney four-two-four, you are cleared for immediate landing, runway six.*

This dialogue is fairly straightforward. The controller may, depending on conditions, order an incoming flight to enter a holding pattern until it is clear to land or to hold short of a particular runway after landing on the cleared runway.

In *MFS2000* you are never asked to enter a holding pattern or to perform a procedure turn, but you should keep your eyes open for other planes taking off and landing in the vicinity. This is more of an exercise than a necessity, because the dynamic scenery in the game is not really dynamic. For example, don't be surprised if

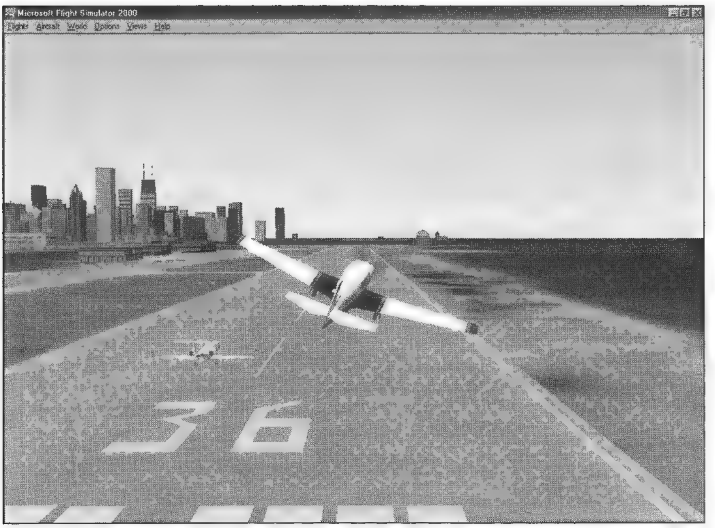


Figure 6-14
Meigs Tower, Mooney four-two-four. Are you awake down there?!?

another airplane takes off right through your plane while you sit on the runway. Still, a serious pilot should behave as though the environment is real.

What'd He Say?

Because real air traffic control procedures are not implemented in *MFS2000*, you can blissfully ignore most of the messages you get from the tower. Still, it's nice to know what they're trying to tell you sometimes, if for no other reason than to provide the feeling of flying a real plane. Following are a few translations of the tower's sometimes-cryptic messages.

INFORM CONTROLLER ON INITIAL CONTACT YOU HAVE WHISKEY

This is not a request for a customs declaration! The tower is letting you know what the latest ATIS update is. ATIS is the automatic terminal information service, and it can be tuned in on your COM radio. It provides a continual recorded update on the weather, visibility conditions, and which runways are being used for landing and takeoff at the airport. The automated system gives the air traffic controllers a break so that they don't have to repeat all of the information each time a new aircraft enters the pattern. Subsequent messages are tagged with a letter from the phonetic alphabet, so that when you first contact ATC, you can tell the air traffic controller how up-to-date you are.

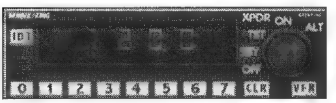


Figure 6-15 The transponder controls are at the very bottom on your COM stack.

SQUAWK 0219

"Squawk" any four-digit number refers to your assigned transponder code. If you were to receive a specified number, you would enter it into the transponder display on your radio stack so that the air traffic controllers can keep track of you.

CHAPTER

7

Qualifying Flights

OK, folks, it's time to get serious. You didn't think we'd stay in the classroom forever, did you? After giving you a taste of flying in chapter 3, the principles of flight and a crash course on instruments in chapters 4 and 5, and a detailed review of navigation in chapter 6, our next stop is Lindbergh Field, San Diego, where we take off for the first of two checkout flights.

This time, we do much more than shake our wings and coast onto the runway. With the aid of our resident pilots, Mike Brooks and Hank Stanley, we take you through preflight, takeoff, cruising, approach, and landing the Cessna 182S and Boeing 737-400. We examine specific flight techniques geared to each airplane and use two different methods of navigation: VFR (visual flight rules) for the Cessna and VOR (very high-frequency omnidirectional range) for the 737. We also complete an ILS approach in the commercial airliner. We encourage you to use the *Microsoft Flight Simulator 2000* Flight Planner to configure similar flight plans and fly along with us.

QUALIFYING FLIGHT #1: CESSNA 182S

Microsoft Flight Simulator 2000 makes it easy to jump into your favorite airplane, give it full throttle and take off without a care in the world. In reality, you would go through an extensive preflight checklist before even releasing your parking brake. Amazingly enough, you can do many of the same exercises in *MFS2000*. Mike Brooks walks us through preflight and guides us to a perfect landing at John Wayne Airport in Santa Ana. It's getting a little chilly at Palwaukee Municipal, Mike's home airport west of Chicago, so we're sure he appreciates the change of venue to sunny San Diego.

Preflight

Outside the Airplane

Some of the most important preflight checks are performed outside the airplane when you complete a visual inspection. If we

could step down from the cockpit, we would circle the airplane to examine and test various external components such as these:

- Release tiedown.
- Check flaps and ailerons for freedom of movement.
- Visually inspect gas tanks; take samples and check for water.
- Check oil level and tire pressures.
- Check struts for excess flattening and rusting.
- Check pitot tube for clogging.
- Inspect and clear gas vents (if clogged with bugs).
- Check stall indicator on left wing (tab comes up in a stall, triggering a cockpit warning buzzer).
- Tighten all access panels.

In the Cockpit

Make sure the parking brake is engaged (default preflight setting in *MFS2000* when you begin on the runway). Your airplane's engine should be running when you arrive at Lindbergh. The following list includes only the necessary adjustments that are not covered by the default game settings.

- Open throttle 1/4 to test, then pull back to idle.
- Switch on auxiliary fuel pump.
- Turn on NAV lights and beacon (if necessary).
- Check gauges for proper functions.
- Set NAV and COM radios (see below).

Because we are flying under VFR rules, it's not necessary to file an official flight plan, but we use the *MFS2000* Flight Planner to plot our course and acquire important information for our NAV radio. After creating our flight plan, which is placed in the Navigation Log (click on the Flights menu, then Navigation Log), we know that our first VOR is MZB, at a frequency of 117.80, so we set our NAV 1 radio accordingly (Figure 7-1).

When we set COMM 1 to Lindbergh Field's ATIS frequency (134.80), we receive a weather banner across the top of the screen.

TIP

Although you can access the Navigation Log at any time by clicking Flights, then Navigation Log, you can find the same information in your GPS display. Click the Display/Hide GPS button, just above the rudder trim wheel at the bottom the instrument panel. With the GPS panel open, click the Mode button repeatedly until the Route Info screen is displayed.

Figure 7-1
Our NAV 1 radio is set to the first VOR: MZB (117.8).

This is a continuous report without a request for confirmation, so we must change our radio frequency after reading the weather, or it will continue scrolling across the screen.

Next, use the OBS button on the VOR 1 indicator to rotate the compass card until the directional needle is lined up with the vertical axis. When it is aligned, the index (gold triangle) points to our initial VOR heading. After our initial climb, we can activate the autopilot and press the NAV button, and Cessna will fly to the VOR. We can also set the HDG bug on the heading indicator to the VOR bearing of 324, and then click on the autopilot's HDG button. In either case, our course will be reoriented after taking off to the east on Runway 9 (Figure 7-2).

Takeoff

The weather is clear in San Diego (what else is new?), so our visibility is excellent. Although the Lindbergh runway is long enough, we set the flaps at 10 degrees for a little added lift on takeoff. After

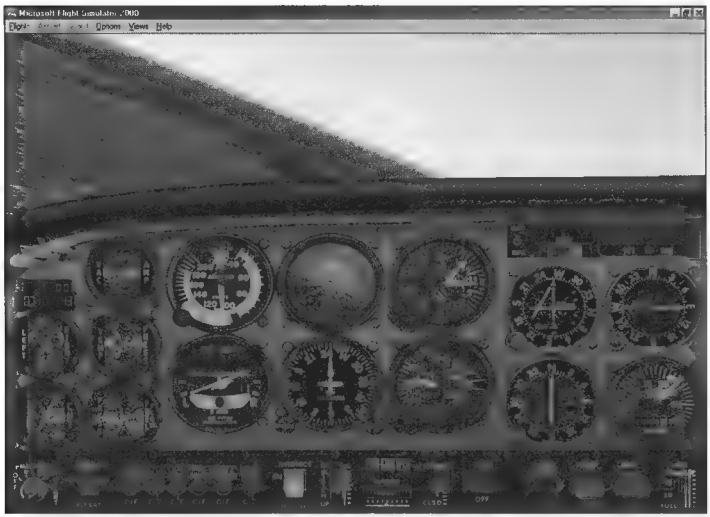


Figure 7-2
With the NAV button selected on the autopilot, our Cessna turns toward the Mission Bay VOR (MDB).

releasing the parking brake, we give our Cessna full throttle and roll down the runway, using the rudder or stick for slight corrections to keep centered. At about 60 KIAS (knots, indicated airspeed), we pull back gently on the stick and rotate off the runway, achieving a comfortable 10 degree climb (use the elevator trim to make fine adjustments to your pitch). When we are clear of any buildings, we retract the flaps and continue accelerating to 80–90 knots.

It is a good idea to check the surrounding airspace at 1,000 feet, so we bring the nose down slightly and scan the hopefully friendly skies. At the same time, we engage the autopilot and click the NAV button, which turns the Cessna toward the first VOR, while continuing to climb to our cruising altitude of 4,500 feet.

As we approach 3,000 feet we reach and pass the first VOR, so we can dial in the next one, OCN (115.3), and readjust the OBS button on the VOR 1. There is an intersection waypoint before OCN, but it's on the same exact heading, so there's no need to make two adjustments. Our flight takes us along the California coast (Figure 7-3), past Del Mar (sorry, racing season is over) and on toward Camp

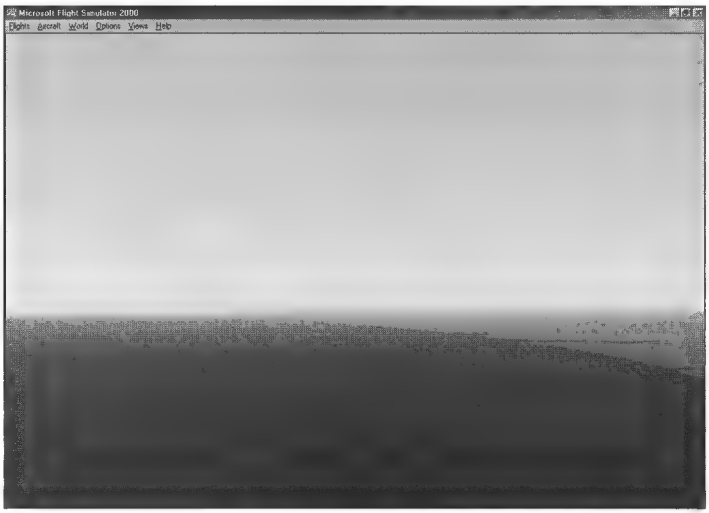


Figure 7-3 With the NAV button selected on the autopilot, our Cessna turns toward the Mission Bay VOR (MDB).

Pendleton Marine Base (and preserve). On a day like today during early spring, we might see a gray whale breeching as it migrates south, but on this November day, the ocean surface is clear.

Cruise

We are now about 26 miles north of San Diego, cruising at 90 knots at just past 4,200 feet. Now we can run through the cruise checklist.

- Reduce propeller rpm to about 2,200.
- Lean the fuel mixture (saves gas).
- Close cowl flaps.
- Adjust elevator trim to maintain altitude at 4,500 feet
- Turn off fuel pump.

After reaching OCN our next three waypoints are intersections, so we can use our GPS map and HDG bug on the heading indicator to dial in the DAMPS intersection at 302 degrees.

We continue to adjust elevator trim until we achieve level flight at about 4,600 feet. The next two intersections, KRAUZ and BALBO are both at heading 301, and they are only a few miles apart, so we don't really need to make any more corrections until we reach BALBO, where we turn right to a heading of 010 that will take us on the downwind course (parallel and opposite to landing) to John Wayne Airport. However, at KRAUZ we will start an initial descent at roughly 500 feet per minute to reach 3,500 feet by the time we cross BALBO, as pictured in Figure 7-4.

NOTE

The DME indicator continues to display the distance from the last VOR, but the Waypoint Info screen on the GPS shows distance and approximate arrival time at DAMPS intersection.

Approach

As we turn at BALBO intersection to a heading of 010 to a downwind leg to John Wayne Airport, we make the following adjustments and begin our descent. Adjusting the propeller rpm to 2,000 increases our descent by reducing the airplane's thrust. Our goal is to reach 1,500 feet as we fly by the airport on the downwind leg (Figure 7-5). We also restore the fuel mixture to rich by pushing the mix knob all the way in.

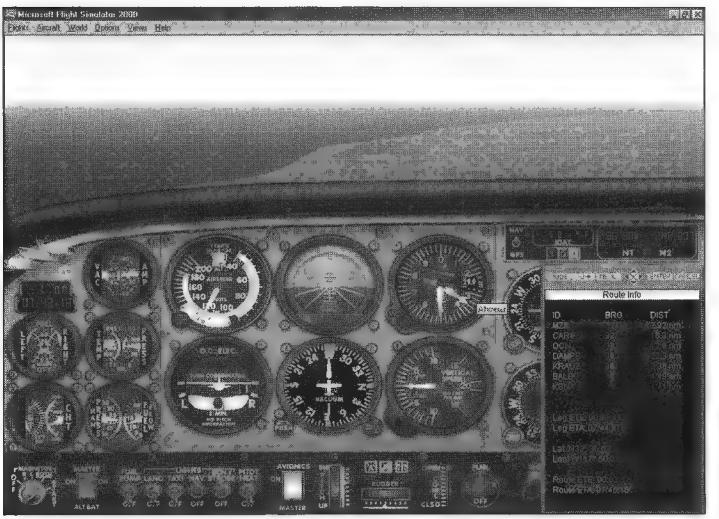


Figure 7-4
As we approach 3,500 feet on the descent, our speed has increased to 120 knots, but by the time we reach the downwind course, we will decelerate back down to 80–90 knots.

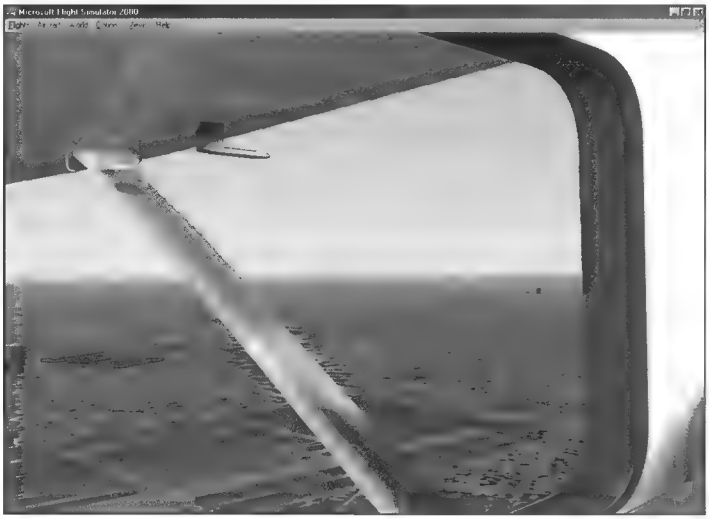


Figure 7-5
Our Cessna is approximately one mile from John Wayne Airport on the downwind leg.

As we continue past the airport, we slow our speed down to 80 knots and extend 20 degrees of flaps. We'll go to 30 degrees as we turn toward base leg and our final approach.

Landing

We are lined up for Runway 19R, which in reality is reserved for commercial airliners, but because we are controlling the skies today, we'll land with the big boys. As we drop to 300 feet, we see the VASI lights that tell us whether our plane is above or below glidepath. Figure 7-6 shows a combination of red and white lights that tells us we are right on the glidepath. All white lights signifies too high, and all red signifies too low.

Our target zone is the landing threshold designated by white lines across the runway. This is a relatively short runway (5,700 feet) for commercial traffic, so the threshold is located right at the end of the runway. Basically, this means that we have little or no margin for error on touch down.

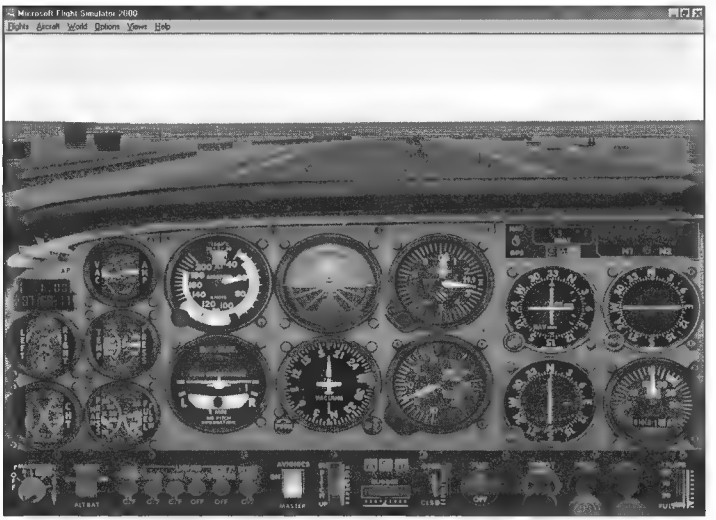


Figure 7-6
We are at 60 knots and lined up for runway 19R.

As we pull to within 10–15 feet of the runway (Figure 7-7), we start to ease the nose up, and when we get under 10 feet, the throttle is pulled out to idle. As we land (Figure 7-8), we adjust the rudder or rudder trim to stay centered. Our goal is to land softly on the main landing gear. We brake and take the first left turn over to the main terminal. Now our biggest decision is whether or not we have time for a volleyball game in Laguna Beach before dinner.

QUALIFYING FLIGHT #2: BOEING 737-400

After taking the Cessna 182S out for a spin, it's time to get heavy with a Boeing 737-400. For our test flight we will take off from O'Hare International Airport in Chicago using runway 14R, the default position when you select O'Hare in *MFS2000*, and cruise to Detroit Metro-Wayne Airport. We'll use the Flight Planner to create a Nav Log for this trip so you can follow along with us.

Figure 7-7
Lined up perfectly and ready to kill the throttle.

Figure 7-8
A perfect landing at John Wayne Airport.

Preflight

In the preflight checklist included with *MFS2000* (open the Kneeboard and select the Checklist tab), our only instruction is to release the parking brake. Obviously, it takes a bit more to get a 737 ready for takeoff. So, let's invite First Officer Hank Stanley into the cockpit to give us some additional insights into what goes on before takeoff. The following instructions take us all the way to takeoff. We'll skip the external checks performed before the Cessna flight, because the airline's ground crew takes care of that while we settle into the cockpit.

In a real 737, you would set three bugs on the airspeed indicator: 1) V1 for decision speed, 2)VR for rotate speed (point at which you pull back on the yoke), and 3)V2 for take-off safety speed (safe airspeed for single-engine climb in case you lose an engine during takeoff). Because there is only a single bug in *MFS2000*, set it for V2 at 160 knots (Figure 7-9). The recommended speeds in the Reference section of your Kneeboard are 155 and 162, but you can only adjust up or down by 10.

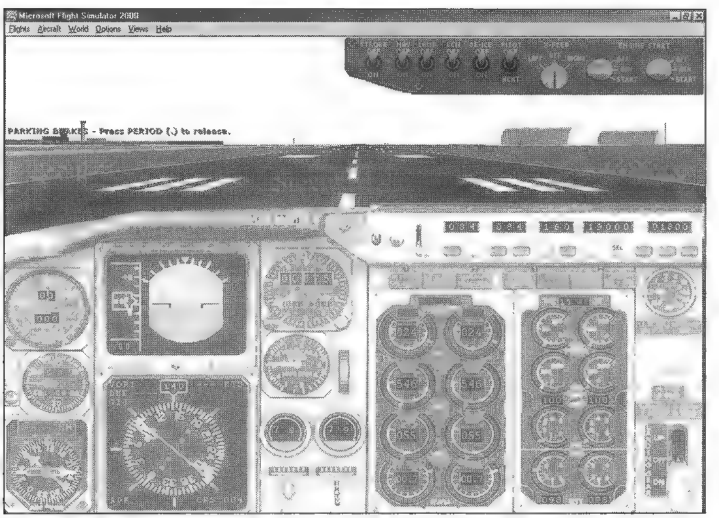


Figure 7-9
Airspeed indicator bug reflects 160-knot V2 speed.

Set Course

As we continue checking gauges and instruments, we arrive at the HSI (horizontal situation indicator), where we verify and/or input course information. Because we are flying to Detroit, which is due east from O'Hare, we set our VOR course setting to 100 to match the first VOR on the flight plan (see Flight Planner in the next section for instructions on obtaining course data) by clicking on the Nav Hold Selector (+ or -) until you reach the desired setting. The course adjustment is reflected on the HSI (horizontal situation indicator).

By default, NAV 2 is set for 113.90, which is the Chicago VOR. (Open the radio stack to view your NAV settings.) The RMI (radio magnetic indicator), located in the lower-left corner of the panel, displays a compass card with the aircraft heading at the top, ADF navigation information on the single needle, VOR bearing information on the double needle, and DME (distance in nautical miles from the selected VOR) for either NAV 1 or NAV 2 (as selected by the red button).

NOTE

After you use Flight Planner to setup your route, click Flights, and then Navigation Log at any time to display the frequencies mentioned above (see Figure 7-11).

With the radio stack displayed, we set the NAV 1 for 115.40, the GIJ VOR, as per our O'Hare to Detroit Wayne-Metro flight plan. When the NAV 1 receives data, you will see magenta indicators with glideslope and localizer information on the attitude indicator (AI) and the HSI (Figure 7-10).

FLIGHT PLANNER

When flying a commercial airliner, it's always desirable to preset as much data as possible. When you use Flight Planner (Click Flights menu, then Flight Planner) to input your airport of origin and destination, you receive VOR and intersection data.

Autopilot Panel

The Autopilot panel, located on the upper-right half of your instrument panel, includes switches and settings for programming the autopilot. These settings are explained in this section because they apply to preflight procedures. The remaining settings will be changed during flight, when the autopilot is used to fly the airplane.

Figure 7-10
Data received from NAV 1 appears on the HSI, RMI, and AI (glideslope and localizer information only).

Figure 7-11
Navigation Log screen for our Chicago–Detroit flight.

NAV/GPS

The NAV/GPS switch tells the autopilot to follow VORs from the NAV radios or to use the GPS for instructions. The GPS automatically loads your flight path. With GPS engaged, you do not have to tune the NAV radios.

FLIGHT DIRECTOR (F/D) ON/OFF

When turned on, the FD gives you guidance throughout the flight by providing course changes (pitch and roll commands).

AUTO THROTTLE ARM (A/T ARM)

When activated, the A/T Arm lets you click the TO/GA (takeoff/go-around) switch to automatically set the throttle to the computed takeoff power setting. In actual 737 takeoffs, this switch would not be engaged until approximately 40 percent N1 power (low pressure compressor rpm gauge). It will further adjust to climb power and cruise power. When you reach cruise power, you can also manually adjust the speed by clicking (+ or -) on the IAS/MACH setting in the autopilot panel.

A/P MASTER SWITCH

Disengage the autopilot. We will manually control the airplane until we reach cruise altitude at which time we will engage the autopilot.

ALTITUDE HOLD SELECTOR

Although the autopilot is not initially engaged, you should set the cruise altitude at 19,000 feet.

Other Settings

Our visual check of gauges and instruments continues; settings that specifically affect your 737 in *MSF2000* are noted. In our preflight check we follow a visual flow of top to bottom on each vertical instrument cluster, and then left to right on a horizontal panel, mirroring the actual process used by 737 pilots.

- Altimeter: Set at field elevation to adjust from the standard setting of 29.92. Make sure that the elevation reading is close to the

actual MSL (above mean sea level) altitude for the airport. This number should initialize correctly to your selected airport. If necessary, click on the BARO knob to adjust the value.

- Trim Settings: Check pitch for proper setting related to your current center of gravity. This does not come into play in *MFS2000*, but on an actual 737, the total weight and actual distribution are considered. Aileron and rudder trim should be centered. For our purposes, set one unit of nose up trim in preparation for takeoff.
- Fuel Tanks: A typical 737 holds 38,000–50,000 pounds of fuel. The load would be fine-tuned to cover the designated flight with enough for an alternate destination. *MFS2000* automatically loads the proper amount of fuel for your flight.
- Flaps: Finishing up our preflight check, we set the flaps to 5, which is the recommended *MFS2000* setting. As a point of interest, the setting is usually flaps 1 on the newer 737-800.
- Auto Brake: Set at RTO (Rejected Takeoff). It will automatically apply maximum wheel brakes and spoilers if the throttles are retarded to idle, above 100 knots while still on the runway.

Takeoff

Immediately before takeoff, we turn on all of our lights, as well as pitot heat (all the time, not just in bad weather). If we must de-ice, we turn it off before takeoff. If left on, it would decrease our available thrust because it draws a significant amount of bleed air from the engines.

TIP

Your rudder becomes effective between 80–100 knots, so don't bother making adjustments until you gain enough speed.

Takeoff Roll

With the Auto Throttle armed, we click the TO/GA button to start rolling (Figure 7-12). If necessary, we make stick or rudder adjustments to keep aligned to the center of the runway. At approximately 150 knots, we pull back slightly on the stick. With the proper elevator trim up setting (one unit), our initial pitch should be around 15 degrees (Figure 7-13).

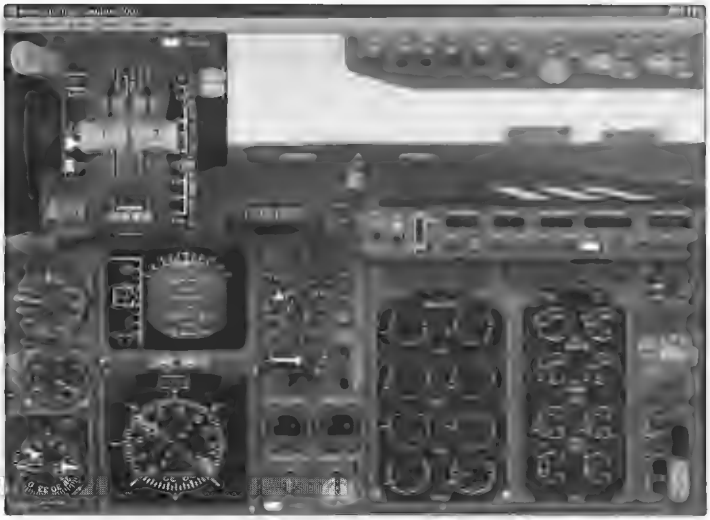


Figure 7-12
Throttles are automatically engaged when you click the TO/GA button.

Figure 7-13
Our 737 climbs comfortably at an initial pitch angle of 15 degrees.

Climb

When the airplane stabilizes in the climb and we verify two positive rate-of-climb indicators (altimeter and VSI), the gear is raised. At 1,000 AGL (Above Ground Level), we lower the nose a couple of degrees to accelerate, and retract the flaps. (Maintain 250 knots below 10,000 feet.

Now select NAV 1 with the red button in the lower-left corner of the RMI and tune up NAV 1 for the first VOR, GIJ (115.4). We turn left to fly direct to GIJ, putting the double needle on the RMI at the top of the compass card. When we reach GIJ, indicated by the double needle swing from the top of the RMI to the bottom, we dial in a course of 084 on the autopilot control panel; this will take us to BENJO intersection (see Flight Plan).

After we pass 10,000 feet, we accelerate to 310 knots. While climbing, we must gradually lower our nose attitude from 10–15 degrees to 3–4 degrees. When we approach within 500 feet of our level-off altitude, we prepare to adjust the nose down to achieve level flight. At this point, the auto throttle should retard to cruise power setting. If it doesn't, pull back on the throttle to an N1 setting of approximately 67 percent.

NOTE

MFS2000 automatically retracts the flaps.

TIP

Remember that course corrections and climb happen simultaneously. You cannot focus only on course correction, at the risk of missing a level-off altitude.

Cruise

We are now leveled off at 19,000 feet and maintaining 310 knots, 19.2 miles east of GIJ, on a heading of 084, as pictured in Figure 7-14. From here to BENJO, we continually monitor our heading to make sure we stay on course.

As you can see, it requires concentration and organization to manually fly a 737. However, thanks to the autopilot, we can take a well-deserved break from all of these manual adjustments. To prepare for automatic flight, we set up our autopilot panel as follows:

- Course: Set to 084 and activate NAV button below.
- HDG: No corrections needed (make sure HDG and APR are *not* selected.)
- IAS/MACH: Adjust to 310, and activate IAS.
- Altitude: Keep setting at 19,000 feet, and activate ALT.

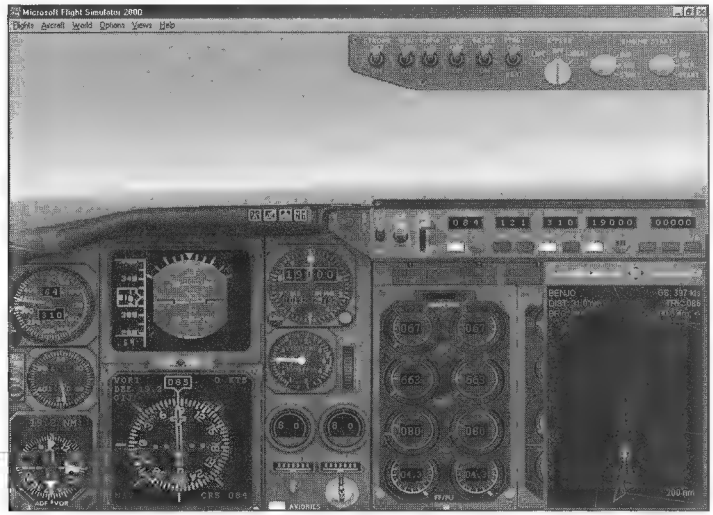


Figure 7-14
We are headed toward the BENJO intersection, where we will make our final course correction for Detroit.

With everything set, we engage the autopilot by moving the lever from OFF to CMD.

NOTE

If you want to observe how the autopilot makes multiple adjustments, activate the autopilot buttons listed above, but do not throw the master switch. Change your speed and heading (the autopilot makes "reasonable" adjustments, so don't go too crazy). Now, turn the autopilot on and watch it bring your plane back on course. It may take a series of pitch and directional adjustments, but within a short time, your 737 will be back on course.

Approach

The biggest factor in descent planning is to make sure that you begin your descent at the proper point. The 737 is extremely efficient and prone to level flight. Therefore, it takes much longer to descend than a smaller, propeller-driven airplane, like the Cessna 182S. Also, from an economical standpoint, commercial airline pilots must focus on proper timing to insure that expensive fuel is not wasted trying to overcorrect for a poorly planned approach.

Pre-Approach

Our first task is to obtain ATIS information for Detroit Metro-Wayne County Airport. We click on World, and then Map View to display the map, and then double-click on the center of the airport (KDTW identifier) to display the Facility Information screen (Figure 7-15). Here we find the ATIS frequency that would normally tell us which runways are active and provide wind and weather

Figure 7-15
The Facility Information screen provides ATIS frequency, runway information, and corresponding ILS frequencies.

TIP

You cannot print the Facility Information directly, so it is a good idea to write down the following information for an approach: ATIS frequency, elevation (important for bad weather approaches), ILS frequency and ILS heading for the selected runway.

information. However, when we tuned in 133.67 for Detroit ATIS in *MFS2000*, we received a report of calm winds without active runway information. In reality we would receive this critical information, and then make decisions for approach and landing. Because we did not receive specific instructions, we dialed in the ILS (instrument landing system) for Runway 3R (111.50) in the NAV 1 radio, and then we added 115.70 in NAV2 for CRL, our last VOR frequency.

Approach

As we pull to within 55 miles of the CRL VOR (tuned in on NAV 2), we enter 4,000 feet in the altitude window of the autopilot control panel. This will begin our descent. We also reduce our airspeed to 250 knots in the IAS/MACH Window. When we close to within 10 miles of CRL, we reduce our airspeed again, to 210, and extend flaps to 5. Finally, we dial in the ILS heading for Runway 3R (034).

We begin final approach by activating the APR button on the autopilot panel (IAS was already activated). Our 737 changes its rate of descent to intercept the ILS glidepath, and adjusts its heading to intercept the ILS course. Now we are ready for our landing checklist.

Landing

In preparation for landing we set the Auto Brake to off, drop the landing gear, extend flaps to 30, and slow the airplane to its landing speed of 150 knots (VREF) by dialing down the speed on the autopilot. Our altimeter reads 776 feet, but we are only 136 feet above the runway because the airport elevation of 640 feet. This is a good point to take over the controls and guide the plane to the runway.

There are three critical factors to keep under control as you get ready to land. The following tips will help you land the 737 and the other airplanes in *MFS2000*.

- Airspeed: If it falls to slow, you will stall; and if you come in too fast, especially in a 737, you can blow tires or scoot off the runway. *Keeping your speed under control requires a coordinated throttle response to your pitch attitude.*
- Lineup: The tendency is to chase the lineup by not allowing your last correction to take effect, causing you to make too many corrections. The 737 in *MFS2000* is overly pitch sensitive, so this is even more critical.
- Glidepath: Control your descent rate by varying pitch attitude. The biggest error is to over-correct up or down. You should only require fine adjustments when your airplane is close to the runway. If you need big adjustments, you should probably go around.

We ease our 737 down to the runway, maintaining attitude all the way down to 20 feet. Below 20 feet, we slowly bring the power to idle and raise the nose 1–2 degrees (soft flare) and let the airplane fly onto the runway (Figure 7-16). We slowly lower the nose

Figure 7-16
A slight flare allows our 737 to settle softly onto the runway.

to bring the nosewheel to the runway, and then engage reverse thrusters. We add in brake pressure, slowly reduce to taxi speed and roll to a stop. Piece of cake!

Right. Actually, landing the 737 takes practice, patience, and a gentle touch. Before long, your passengers will be sipping piping hot French onion soup on touch down without losing a drop.

PART

II

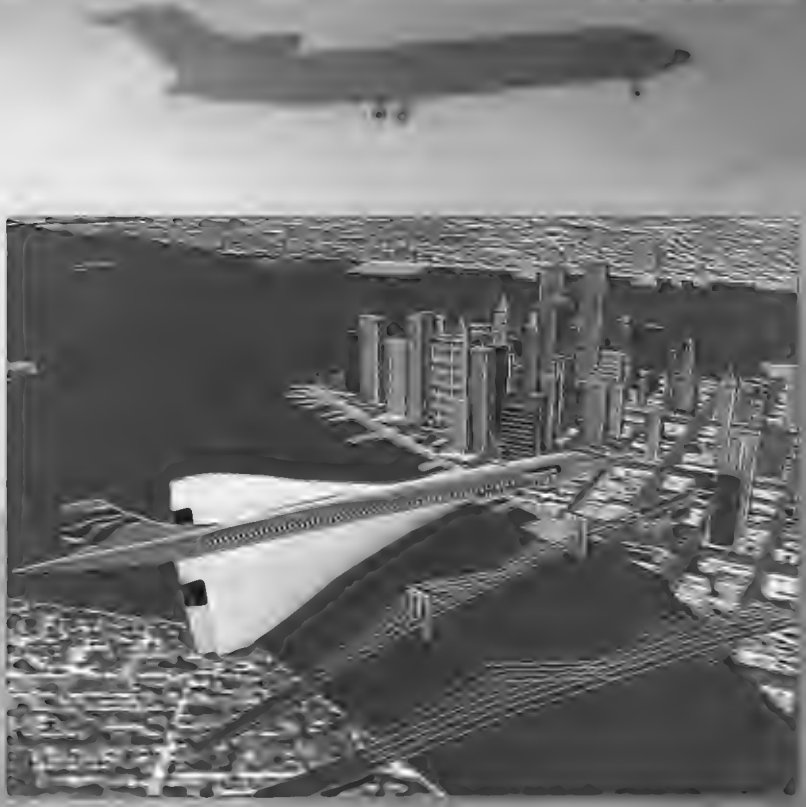
Theme Flights

Across the Pond: Concorde is the first of our theme flights—talk about starting at a full sprint! Each theme flight is designed to give you a feeling for the featured plane, so we focus on the attributes that set it apart from other aircraft. To get the most out of the theme flights, you should first read (and fly) Chapter 3—Flight Primer and Chapter 7—Qualifying Flights, which contain specific, hands-on instructions for the navigational instruments used in the theme flights. In fact, we assume that you already know how to use these instruments, so we may not explain each process in detail. If you are unsure about how to implement some of the procedures, review the appropriate sections in chapter 3.

CHAPTER

8

Across the Pond: Concorde



The Concorde SST is the first and only commercial passenger aircraft that flies faster than the speed of sound—twice as fast, actually. Only 13 planes exist, so few people ever have the chance to fly in this graceful supersonic bird, let alone pilot it. In *MFS2000*, you have this opportunity any time you want. Because the real Concorde only makes trips across the Atlantic Ocean, it makes sense to copy that flight path in the simulator. This chapter takes you from London to New York in a scant three-and-a-half hours.

When it comes to achieving (and maintaining) stable flight, the Concorde is the most difficult aircraft to fly in *Microsoft Flight Simulator 2000*. This aircraft's performance envelope is huge, as is required for an airplane that travels faster than Mach 2, yet the plane is bigger than most buildings and must land at under 160 knots. All that power under your wings must be managed very carefully in order to keep it working for you rather than fighting against you. Patience and practice will lead you to a long and successful career at the controls of the Concorde.

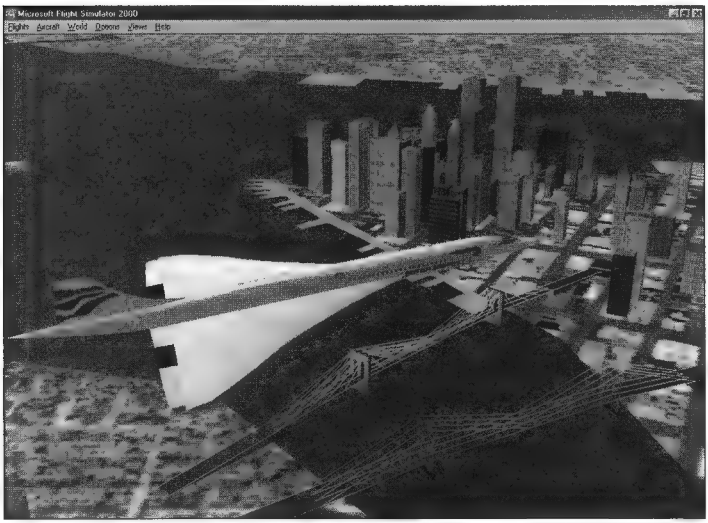


Figure 8-1
Microsoft Flight Simulator 2000 offers you the rare chance to fly the world's only supersonic airliner.

FAREWELL TO THE QUEEN

First select the Concorde from the Aircraft menu, then use the Go to Airport menu to transfer to Heathrow, outside of London, England. Set up on Runway 27R for a nice, long takeoff run in the direction of your flight. Make sure your weather settings are calm unless you want a challenge in the extreme, as the Concorde is hard enough for the average aviator to fly on a clear day.

Create a GPS flight plan by opening up the Flight Planner window from the Flight menu. Select Heathrow's Runway 27R as your point of departure (POD in aviation circles), and find Kennedy International Airport in New York, New York as your destination. Use Runway 22R in the states to avoid overflight of populated areas as much as possible on your final approach. Set the flight to IFR (Instrument Flight Rules) by clicking the associated bullet, and choose Direct-GPS auto routing. Click on Find Route when you input your selections to automatically generate a flight plan.

You may review the flight plan immediately in the Flight Planner window. Notice that your course is automatically plotted in the optimum Great Circle route, which compensates for the curvature of the Earth. Now that your course is laid in, you can use the GPS menu in your cockpit to navigate all the way across the Atlantic Ocean without having to stop for directions even once!

Set your nose cone to 5 degrees extended in preparation for takeoff. Lowering the Concorde's nose improves the low-speed handling characteristics of the airframe. When ready, spool up the mighty engines to full power, and then light the afterburners to assist your takeoff. Your rotation speed is 190 knots, but your plane will not exactly bound into the air at this speed. Rotate your nose to 10 degrees nose up—no more, no less. A mere two-and-a-half more degrees of pitch will drag your tail—your decision speed way back at 165 knots, so scraping the asphalt will do bad things to your itinerary.

TIP

Flying the Concorde is an extremely complex exercise, laden with very specific speed and weight tolerances that you must manage constantly. Refer to the Kneeboard often during all phases of flight. Other challenges include the flight model itself, which is not fully optimized. You may experience some simulation errors and confusing, erroneous warnings when flying the Concorde. For example, you may get an overspeed indicator a few moments after takeoff, even though you're nowhere near your optimum climb rate.

Figure 8-2
Ready for takeoff from Heathrow Airport.

Figure 8-3
Hold the nose rock-steady after rotation, and wait for your lift to take you into the air naturally.

The airplane crawls into the air at about 215 KIAS. Retract the gear, and hold your 10-degree pitch angle until you reach 250 knots. Pitch up to maintain 250 KIAS as you conduct your departure, which will take you close to 20-degrees nose up. Maintain this attitude, and deactivate the afterburners. Even without the extra kick, the aircraft will accelerate at a 20-degree positive pitch angle. When you pass through 270 KIAS, bring the nose cone to its fully upright and locked position (putting it in line with the tray tables in the passenger compartment). Ease up on your pitch now, to settle down into a 5–10-degree ascent. You will accelerate once again, this time through 300 knots.

Though you are now at somewhat of an equilibrium, lower your pitch a few degrees to accelerate yet again. The Concorde's unique design does not handle pitch, thrust, and angle of attack the same as conventional aircraft do. By pitching down, you reduce the drag acting upon the aircraft, resulting in acceleration. This higher speed in turn raises the nose, which allows you to

Figure 8-4
Attacking the sky with the Concorde's sleek lines. Even today, no design changes would increase performance enough to warrant the cost of producing a new breed of SST; the Concorde was decades ahead of its time.

NOTE

Because you're making the westbound trip across the Atlantic, you won't have to worry about the pesky noise pollution laws that complicate the Concorde's service over the United States. Several time-consuming maneuvers and throttle setting restrictions make a departure from JFK International a burden.

Figure 8-5. The handy picture-in-picture feature provides you with a dramatic view, while still allowing you to fly the airplane. Illustrated are optimum settings and attitude for your ascent to the subsonic cruise stage.

TIP

If you are manually controlling your CG (Center of Gravity) with the fuel panel, now is the time to check it out. You should maintain a CG of about 54 percent aft in the cruise.

repeat the process all over again. Once you achieve an indicated airspeed of 400 knots, allow the nose to rise up to maintain this speed. Ascend to FL 300 (flight level 300; that's 30,000 feet without all the zeros), and then level off and throttle back to perform a subsonic cruise to the coast at about 0.95 Mach.

YOUNGER BY THE MINUTE

Once you pass over the coast, you are ready to transition to supersonic flight. Before you give yourself the additional handful of piloting duties, check on your GPS track and adjust your course if necessary. Also give some attention to your fuel distribution by taking a look at the CG meter, located beside the fuel meter to the upper-right of the HSI. You should be constantly pumping fuel aft by this time, as you'll be burning it faster than you can transfer it in the supersonic cruise portion of the flight.

When satisfied with all of your settings, throttle up and relight the afterburners. At the sound barrier, you'll notice a distinct shudder, and you may have to make some small attitude adjustments. As you pass through the transonic region (roughly 0.95 Mach to 1.4 Mach), be very careful to avoid any gross control inputs whatsoever, as this is a critical point in supersonic flight. If an accident is going to happen, this is generally the point at which it will occur, so don't relax until you're firmly cruising at supersonic speed. Mach 1.5 is a CG-critical speed, so make sure you're within the CG indicator's bugs.

Cut the afterburners at Mach 1.75, as you can accelerate without them in the thinner air. Check your GPS heading as you continue to accelerate up into the sky. Maintain your climb and acceleration until you reach either Mach 2 or FL 500. Once you've achieved both, level off and adjust the throttle to avoid overspeed. You should move the CG back to around 59% aft for your supersonic cruise, but remember to move it forward before you land.

Figure 8-6
Leaving the Irish coast in our supersonic dust as we use the GPS to track our way across the open ocean.

The landing gear are 55 percent aft in this plane, so you'll tip the plane on its tail if your CG isn't fore of that mark when you touch down.

COLONIAL TOUCHDOWN

About 150 nautical miles away from the U.S. coast, start decelerating and descending in order to avoid overflying the airport. Throttle back to a conservative 75 percent, or better yet let the autopilot manage your descent by dialing in an IAS hold. If you're descending manually, throttle back farther to descend at 350 KIAS as you drop the nose. Continue your descent and deceleration through Mach 1 at about FL 300. If you're still a ways out, you may need to cruise at 0.95 Mach just like you did while you traversed dry land on the ascent.

Get down to 250 KIAS by the time you descend through 10,000 feet. Below Mach 1, you can idle the engines to bleed speed and altitude. Prepare for landing by adjusting your CG if necessary;

Figure 8-7
On final approach to Kennedy.

place it in front of the landing gear. Deploy the nose to 5 degrees when you reach 270 KIAS, and continue decelerating to an approach speed of 190 KIAS.

Once you are on finals, fully extend the nose downward, and lower your gear at about 1,000 feet AGL. You'll make the approach at about 10 degrees nose up and maintain it all the way though the landing. As with takeoff, anything over 10 degrees positive pitch risks a landing on your tail feathers, so watch your attitude very carefully. Reverse your thrust at idle when you get main gear touchdown, and power up when the nose gear contacts. Brake and reverse thrust until you slow below 100 KIAS. Stow the thrust reversers at 50 knots, and brake to taxi speed.

Figure 8-8
Welcome to the United States! Please declare your baggage at customs.

CHAPTER

9

Barnstorming Berlin: Sopwith Camel

What better way to check out one of the newest high-resolution cities in *Microsoft Flight Simulator 2000* than to fly low and slow in a Sopwith Camel over Berlin? Actually, the nimble Camel has a ceiling of 19,000 feet, but it is less than comfortable at that level, and with a limited range of 300 miles, we must be careful not to overextend our flight plan. So, our short flight takes us 148 miles from Hamburg (Hamburg Airport) to Berlin, where we land at Schonefeld Airport. Before we roll down the runway, let's take a closer look at our Sopwith Camel F.1.

SETTLING IN

The Sopwith Camel is a two-seater with a simple instrument panel that reflects the technology of its time (1917–1918). As you slip into the pilot's seat, you notice, well, nothing but sky (Figure 9-1). Because it is a taildragger (has tailwheel landing gear), you cannot see past the instrument panel, so you must weave back and forth during takeoff to make sure that you are centered on the runway).

Figure 9-1
If you want to see the runway, you'll need to wheel right and left to see where you're going. Of course, you could always cheat and tap W to make the instrument panel go away.

Fortunately, most planes in *MSF2000* track nicely while taxiing, so you shouldn't have any problems, unless of course your joystick needs calibration.

By now you've probably noticed the lack of instruments on the panel. The altimeter, inclinometer (poor man's turn coordinator), and compass are your most important gauges for navigation—along with your eyes. Forget about ILS approaches or VOR beacons; this is strictly a VFR flight. To get the full effect of flying the Camel, resist the urge to click the GPS button in the lower right-hand corner of the instrument panel. If British fighter pilots were able to shoot down 1,294 enemy planes without GPS, surely you can make it to Berlin without it.

TAKING OFF

The Sopwith Camel rotates at about 55 mph. There are no flaps, so all you need to do is keep the plane in the middle of the runway, open up the throttle and point it to the sky. As we climb, turn to a heading of 121 degrees, which points us toward Berlin. Oops—

Figure 9-2
The Camel's side view gives you a real feeling of open-air flying.

make that a few compass ticks to the right of SE. Where's a Heading Indicator when you need it? Briefly level off at 3,000 feet (note that the altimeter moves backward), so that you can become accustomed to the limited visibility. Use your side views (Figure 9-2) and imagine seeing a Fokker Triplane zooming by and trying to get on your six. Actually, your Camel would beat the Fokker in a race, but the German fighter was extremely agile and a speedy climber.

A CAMEL TRICK

After checking out the scenery, continue climbing to about 8,000 feet, where we'll practice a few evasive maneuvers. The Camel tops out at 114 mph, but for our flight, reduce throttle to about 30 percent, which puts you at around 80 mph in level flight.

Shortly before the Camel made its debut in World War I, German pilot Max Immelmann revolutionized air warfare by using his Fokker Eindecker in a vertical attack. The Immelmann turn, as it became known, is described in detail in Chapter 18—Aerobatics. However, because we are flying a World War I fighter plane, it only seems fitting that we pull off an Immelmann on our way to Berlin.

Our plane lacks the thrust of modern fighters, or even the World War II–era P-51 Mustang, so we need a little help to get enough speed for the vertical portion of the Immelmann. Prepare by taking the Camel up to 12,000 feet. A 3/4 throttle setting should take your Camel smoothly to our target altitude at about 70 mph.

Immelmann: Stage One

To begin the Immelmann, point your Camel into a dive and continue to 11,000 feet. This dive replicates an initial attack on an enemy fighter below. Your Camel will shimmy and shake as you bury the needle on your airspeed indicator. You might want to pause your dive for a moment to view the Elbe River snaking its way through Germany to Berlin. American and Russian forces met on the Elbe, west of Berlin, in April, 1945, as the Allies advanced on Germany—just a few weeks before May 8 marked the end of the war in Europe.

Figure 9-3
As our Camel picks up speed, we see the Elbe River far below.

Immelmann: Stage Two

As our altimeter reads 11,000 feet, we break off the "attack" and pull back on the stick about 2/3 to initiate our climb. Because the Camel lacks adequate thrust for a lengthy vertical climb, be prepared to let off the pitch as soon as the plane is vertical (Figure 9-4).

Immelmann: Stage Three

After reaching the vertical position of stage two, spin the Camel on its tail by executing a roll to the left until your plane is pointing in the direction you want to go (Figure 9-5). Finally, roll back to an upright position and execute the second attack on the same plane (if it survived the first one!).

ON TO BERLIN!

Whew—there's one way to clear your sinuses! After completing your Immelmann, make sure that you are still heading a couple of

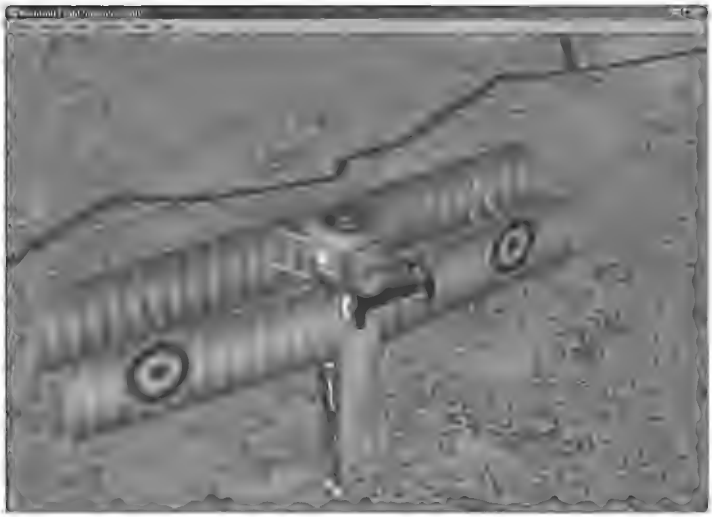


Figure 9-4
You lose speed quickly in a vertical climb, so get ready to start your pirouette.

Figure 9-5
With the Camel on its back, you are in perfect position to roll out and into the attack.

clicks to the right of SE on your compass. If you'd rather take the long route, you can meander along the Elbe. Just make sure that you don't take one of the forks branching off to the north, located about 60 miles from Berlin.

With your high-altitude chicanery out of the way, you can settle in at about 3,000 feet for the rest of the flight. If you stay on this course, you'll intersect the beginning of the runway at Schonefeld, so you should make a slight correction to the south to give your Camel enough room to make the left turn to the airport. Your compass needle should split SE when you adjust, putting you 90 degrees south of the runway.

APPROACHING SCHONEFELD

Schonefeld is the third of three runways (on your left) that you pass on your way to Berlin. After you pass Tegel and Tempelhof, you're about 12 miles from Schonefeld. Adjust your heading one more time to line up for the right runway. Your previous course correction takes you south of the airfield. When you turn back and align with the runway for your final approach, the compass needle should rest between E and NE (Figure 9-6).

NOTE

Tempelhof was one of the airfields that received Allied transport planes carrying supplies during the Berlin airlift of 1948–49.

It's easy to prepare the Sopwith Camel for any landing, even if you appear to be too close to the runway. The trick is to land without bouncing, because unlike the Cessna 182S, or most of the airplanes in *MFS2000*, the Camel is a taildragger. So, instead of flaring onto the runway, you want to touch down at less than 60 mph, and as flat as possible. Once you touch down, pull back on the stick until you come to a stop.

SIGHTSEEING OVER BERLIN

After topping up the fuel and picking the bugs out of your ears, you might want to take a little side trip over Berlin. Take off from Schonefeld and make a hard left bank back towards Tempelhof, the second airfield that you passed on the way into Schonefeld. After you fly over Tempelhof, make another left bank, before you reach Tegel, and you'll be over Berlin. As you fly between the two

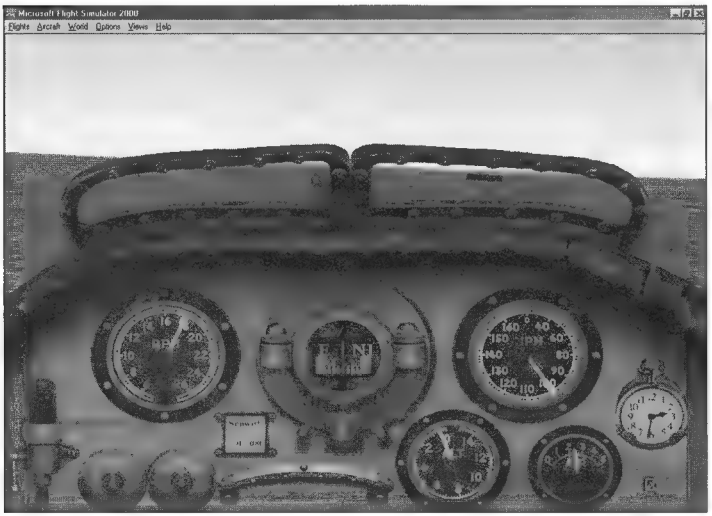


Figure 9-6
Playing peek-a-boo with the Schonefeld runway through the Sopwith Camel's windscreen.

airfields, your Camel's compass needle should rest between W and SW.

You can spot one of the more interesting sights in Berlin by flying west from the center of the city, but only if you turn the calendar back to January, 1982. The Berlin Wall is still in place (Figure 9-7). When the wall was standing, the Brandenburg Gate, built in 1791, was the foreboding guardian of East Berlin.

If you turn your Camel around after buzzing the Berlin Wall, you can tour what used to be East Berlin. There's a fascinating blend of centuries-old cathedrals intermixed with modern buildings (Figure 9-8). Of special interest is the Berlin Television Tower (and revolving restaurant), built by East Berliners in the 1960s. It was meant to serve as a symbol that East Berlin could modernize its city without help from the West. Ironically, they had to hire Swiss builders to finish the job when none of the local engineers could implement the structural mechanics required to make it work.

As you pass the tower while headed east, continue flying for a couple of miles and then do a 180-degree turn to the left to land at

Figure 9-7
In a freedom flight, our Sopwith Camel flies over the Brandenburg Gate and Berlin Wall into West Berlin. The wall is still standing in *MSF2000*—if you fly over Berlin in early 1982.

Tegel or to the right to land at Tempelhof. After an Immelmann and low-flying tour of Berlin, our Sopwith Camel deserves a warm hangar for the night.

Figure 9-8
The Sopwith Camel flies east over Berlin, past the Berlin Television Tower and Berlin Cathedral.

CHAPTER

10

Crabbing the Coast: Beech King Air 350

This tutorial flight takes you on a daytime trip from San Diego to Los Angeles, California in the Beech King Air 350. You'll use pilotage to find your way up the coast, relying on visual reference points and your compass to navigate. Your primary concerns are the crosswinds on takeoff and landing in this scenario. Usually, the Southern California coast experiences mild breezes coming in directly from the ocean, but El Niño is bringing in winds from the south today. Besides introducing you to the King Air, this chapter shows you how to compensate for takeoff and landing crosswinds to bring you a step closer to all-weather piloting ability.

SETTING THE SCENE

First, go to the Aircraft menu and change your plane to the Beech King Air 350. Next, open the World menu and select Go To Airport, then choose San Diego International Airport. Select Runway 27 to head west on takeoff. Next, bring up the Weather window

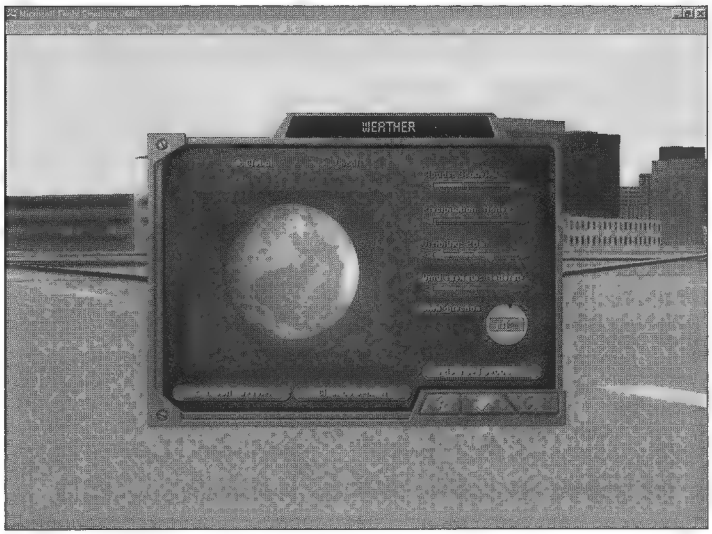


Figure 10-1
Use the Weather window to create the climatic environment for this flight.

from the World menu. Select Scattered cloud cover, with 20 miles of visibility to depict a typically hazy (well, smoggy really) day on the California coast. Next, dial in some moderate winds blowing to roughly 30 degrees to create a crosswind on the runways (in these parts they are generally oriented east-to-west).

TAKEOFF

Taking off in windy conditions requires several considerations before throttling up. First of all, you must account for the direction of the prevailing winds. Always take off as directly into the wind as possible. In this case, the wind is out of the southwest. San Diego only has runways pointing east-to-west, so you're on the western-facing Runway 27, which at least puts you within 45 degrees of the wind.

You must take off in a right crosswind that tries to blow you off the right side of the runway. This is actually good, as far as crosswinds blow, because if you must fight a crosswind, you might as well place the crosswind opposite your propeller-

Figure 10-2
Preparing for takeoff. Expect a strong push to the right due to the crosswind.

NOTE

The King Air usually doesn't need flaps on takeoff, and in crosswind conditions this is a blessing. The more flaps you deploy in a crosswind, the more severely you are buffeted and yawed by wind gusts—especially near the ground. Leave your flaps up on this takeoff run.

induced yaw. That way, the force of the crosswind and the natural yaw of the aircraft cancel each other out as much as possible, instead of combining forces in the same direction.

Even with your propellers compensating somewhat for the crosswind, you still drift right on the takeoff roll. Apply a very gentle left rudder to stay centered on the runway. The rudder is very "squishy," meaning that its response is somewhat delayed. If you stomp down on the pedal, you'll find yourself wagging your tail all over the runway. As with just about every aspect of flight, slow and steady input gets you the results you seek.

Spool up your engines together, gradually bringing your plane up to 100 percent power. Use your pedals to correct for the combined onslaught of the P-factor from your propellers and the crosswind. If you have dual throttle controls, this is the perfect time to use them. Instead of compensating for the wind using the rudder and nose wheel steering, you can simply run your left engine about 10 percent slower than your right. This naturally induces a slight yaw in the aircraft, keeping your plane centered on the runway. Even without a dual throttle control, you can use

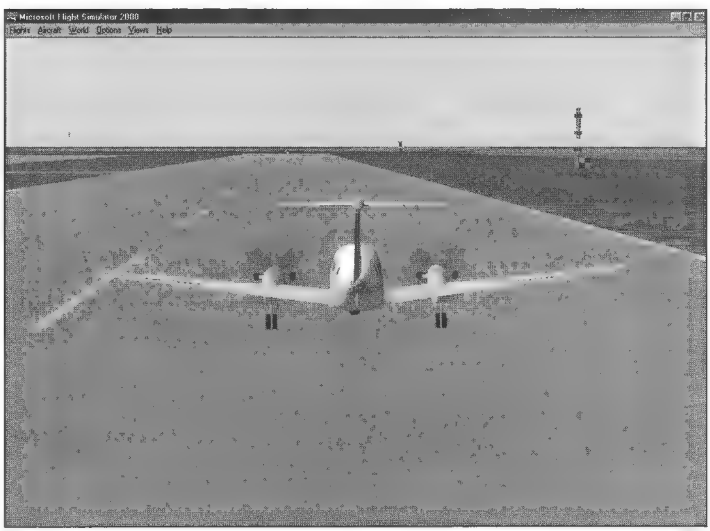


Figure 10-3
A combination of asymmetric thrust and rudder input helps to counteract the crosswind on takeoff. Despite this compensation, we've drifted right of the centerline.

the engine panel to manually adjust your engine settings with the mouse.

The rotation speed in the King Air is about 105 KIAS (knots indicated airspeed). After rotation, you immediately experience an increased wind effect because the ground no longer keeps you in one spot. Dip your left wing into the wind slightly and bring your nose to a heading of about 260 degrees, which is just a tad left of the runway heading. This keeps you in the middle of the departure corridor as you climb out. Get clean by raising your landing gear to reduce the wind's effects. Finally, equalize your throttle settings if you chose to use asymmetric thrust on takeoff.

Climb out to a comfortable VFR cruising altitude of 3,000 feet. Maintain 140 KIAS on your ascent, which is your best rate of climb in the King Air. Miramar and the Naval Air Station on Coronado are on your left, with the city of San Diego farther behind you on the same side. Level off once you reach your cruising altitude, and throttle back a bit to avoid overheating your engines. Once you have trimmed out, prepare for the initial turn on your way to the City of Angels.

Figure 10-4
Crabbing into the wind a little bit will keep you on the centerline of the departure corridor. Notice our alignment with the runway, even though our nose is pointing toward the south.

DO YOU KNOW THE WAY TO EAST L.A.?

Well, we know that Los Angeles is up the coast from San Diego anyway, so we want to make a right in order to start heading for the land of surfboards and celluloid. When you achieve your cruising altitude, you should be just about over the Pacific Coast. Begin a steady right bank, bringing your nose around to a heading of roughly 330 degrees.

You'll fly on this heading for several minutes, hugging the beaches. Although it may initially seem as if you are headed out to sea, the coast soon curves back to meet you. Los Angeles actually lies just about as far west of San Diego as it does North, so you have to adjust your heading to about 300 degrees in order to stay on the coastline. Continue shadowing the coast, adjusting your heading as necessary. After a quarter of an hour, you should be near Long Beach, which faces south and abruptly extends the coast out to the west. Look for innumerable harbors along the coast, and the massive Long Beach breakwater, which protects the vessels in San Pedro Bay from the powerful waves of the misleadingly named Pacific Ocean.

Figure 10-5
Banking northward at 3,000 feet to begin heading for Los Angeles.

Figure 10-6
The bustling commercial and recreational harbors on Long Beach are protected by a long concrete breakwater, which is clearly visible from the air.

Fly over Long Beach and line up on the Los Angeles River. There are two rivers leading inland from Long Beach, but one is much smaller than the other. You're looking for the larger of the two, which is on the right (or eastern) side. Follow the L.A. River inland for three or four minutes, until you see it peter out into the familiar concrete-slab culvert you see in all the movies. If that description doesn't ring a bell, just wait for the river to turn gray instead of blue. You can see downtown Los Angeles in the distance, and beneath your wings is a major highway intersection (Figure 10-7). The highway leading west toward the coast is the 105, which goes directly to Los Angeles International Airport!

THE WING-LOW APPROACH

Line up to the north side of the 105, staying parallel to the road as it passes under your left wing. You won't have to travel far at all before you see the massive expanse of tarmac that is Los Angeles

Figure 10-7
As downtown and the river transition both come into view, you'll be passing over the I-710 and I-105 interchange. The interchange is clearly visible at the bottom of this illustration, with the 105 leading off to the left.

Figure 10-8
On approach to Runway 24L. Notice our nose is crabbed into the wind to maintain the proper line of approach.

International Airport. Throttle down and begin your descent as soon as you see the runways. Choose any one you fancy—they're all open for you in *Microsoft Flight Simulator 2000*, and they're all ten times longer than your minimum landing distance. This may come in handy, though, because you may find yourself drifting all over in this crosswind.

As you make your standard approach, you might drift right of the runway, no matter how carefully you line up. The crosswind continually acts upon your plane, blowing it sideways even though you are pointed straight at the runway. In order to compensate for this crosswind, you must make a *wing-low approach.* This maneuver allows you to maintain a proper runway heading while slipping sideways through the air, counteracting the wind blowing you off line.

To perform a wing-low approach, dip your left wing toward the ground in the direction of the wind. Normally, this would cause you to bank to the left. However, applying gentle and

Figure 10-9
A textbook wing-low approach, with one wing slightly dipped into the wind.

steady pressure on the right rudder pedal will counteract the yaw, keeping your nose pointing straight. Because of the bank angle, however, your lift vector actually pulls you to the left, even though you are facing the same way!

Continue slipping left as you descend on your final approach. Just before touchdown, level out your wings and flare as usual for a gentle landing. Coordinating a leveling roll with your flare may take some practice, but with this much runway you can probably afford two full-fledged landing attempts in a single pass. Set your plane down on the runway and taxi clear to complete this challenge. Congratulations—you just took off, navigated by pilotage, and landed in a moderate crosswind!

CHAPTER

11

Sailing Up High Down Under: Schweizer 2-32

When you need a break from mixtures, throttles, and rpms, nothing clears your mind better than a spin in a sailplane. *Microsoft Flight Simulator 2000* includes a Schweizer SGS 2-32 sailplane, and thanks to the wonders of slewing, you can use a virtual tow rope and fly the glider anywhere in the world. As you would expect for a plane lacking an engine, the Schweizer depends on rising air, or thermals, to stay aloft. However, even without thermals, the Schweizer's 57-foot wingspan, lightweight construction (only 850 pounds), and low profile are conducive to graceful gliding.

True thermal effects are difficult to find in *Microsoft Flight Simulator 2000*. According to the flight manual, Munich, San Francisco, and Seattle are the only areas with thermal air flow over the mountains, however, the *readme* file warns that there are no thermals in Seattle. We found the best air flow north of San Francisco Bay (Figure 11-1).

Figure11-1
Catching a little warm San Francisco air.

Fortunately, the Weather menu lets you design a windy day that gives your Schweizer sufficient air for a lengthy glide anywhere on the map. Go to World, and then Weather. Adjust the Wind Strength slider to Severe, and then click Advanced Weather. Complete these steps to create several wind layers for gliding:

1. Click on the Wind tab, and then create a layer of wind. Set Altitude, Speed, Gusts, and Direction.
2. Leave Shear Strength at the default setting of Gradual, and set light Turbulence. Remember that the idea is to create wind, not choppy air.
3. Create additional wind layers by clicking the Add Wind Layer icon (Figure 11-2). Place at least three layers that begin near 6,000 feet and end at 1,000 feet. Vary the direction on each layer. (Don't try to remember the directions; instead, try to find the flow when you're aloft.)

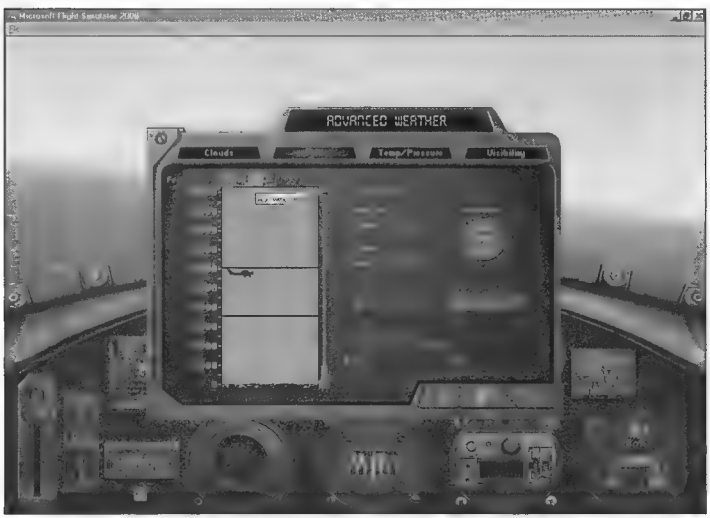


Figure 11-2
Use the Advanced Weather screen to create thermals.

ARRIVING AT TOCUMWAL

Tocumwal, a friendly township tucked on the southwestern coast of New South Wales, Australia, is known for its miniature trains and excellent gliding conditions. With a soaring season that lasts from October to March, Tocumwal attracts novice and veteran sailplane pilots to the Sportavia Gliding Center, which was the largest Aerodrome in the Southern Hemisphere during World War II. It's a haven for cross-country competitive flyers, who set 28 world records over Tocumwal during the 1996–1997 season.

With such a rich gliding history, Tocumwal is a perfect choice for a leisurely spin in the Schweitzer, and, thanks to the wonder of Weather effects, we can create an updraft that'll last all day. Arrive at Tocumwal by clicking World and then Go to Airport. Select Oceania as the Global Region, Australia as the Country/Region, and New South Wales as the State/Province. This narrows the field of cities to 71. Scroll down to Tocumwal and you're on your way.

LAUNCH TIME

After you select Tocumwal and the Schweizer, you'll be sitting on the runway. The only movement you will feel is the sailplane listing to one side when you release the parking brake. Don't wait for the tow plane; it will never arrive. Press [Y] to enter Slew mode (Figure 11-3), and then tap [Q] continually to "tow" your sailplane into the sky. For a long flight, take it up to at least 6,000 feet.

When you tap [Y] to exit Slew mode, you are struck by the conspicuous absence of engine noise. Instead you hear (and feel) the rush of wind as the Schweizer catches air and takes an immediate dive. Slowly ease back on the stick to pull your sailplane into a level flight.

STAYING ALOFT

Competitive sailplane races focus on speed rather than duration, so pilots frequently talk about staying within your "height band." Because we cannot create true thermals in *MFS2000* (pockets of

Microsoft Flight Simulator 2000
Flight Aircraft World Options Views Help
S35° 47.20' E145° 39.07' ALTIT 5686.16 FT. HDG 171 Mag 000000 Pts.
SLEW

Figure 11-3
In Slew mode you can send your sailplane as high as you like.

rising air created by terrain, clouds, time of day, dew point, etc.), it is a bit of a stretch to look for a height band. However, with multiple wind layers, you can get a feel for the rhythm of gliding as you move from one gust of wind to another.

The key is to learn when to leave a thermal. The natural instinct is to stay in a thermal until you start falling. However, experienced sailplane racers leave a thermal when it is still good, but not strong enough to maximize your speed. So, instead of soaring high, dropping quickly, and then soaring again when you gain lift off the dive, an experienced pilot skims from thermal to thermal, losing minimal altitude in the process.

These tips will help you to control the Schweizer and maintain flight:

- Roll gently to change direction (Figure 11-4). Severe banks dramatically shorten your flight.
- Use the dive brakes to keep your speed under 160 mph when in a steep dive.

TIP

If you are losing altitude quickly and you need one more substantial turn to line up with the runway (Figure 11-5), try gently rocking the nose up and down in short, undulating movements, while at the same time, banking in the desired direction. This technique allows you to calculate the turn more accurately, which makes it easier to line up with the runway (Figure 5-6), before you run out of air.

- Fly back and forth in a figure eight when flying along a ridge.
- When calculating your landing course, plan on 20 miles soaring distance per 5,280 feet of altitude. So, if you start one mile up, don't travel more than 10 miles from the airfield if you want to make it back to the runway.

LANDING

Getting your sailplane safely on the runway is all about advance planning. Without a throttle that allows you to make last minute adjustments, you must gently coax your plane through the air, turning inch-by-inch until lined up with the runway. Your sailplane should be traveling less than 50 mph as you sweep in for a landing. If you are coming in too fast, deploy the air brakes, and raise the nose ever so slightly to add more drag.

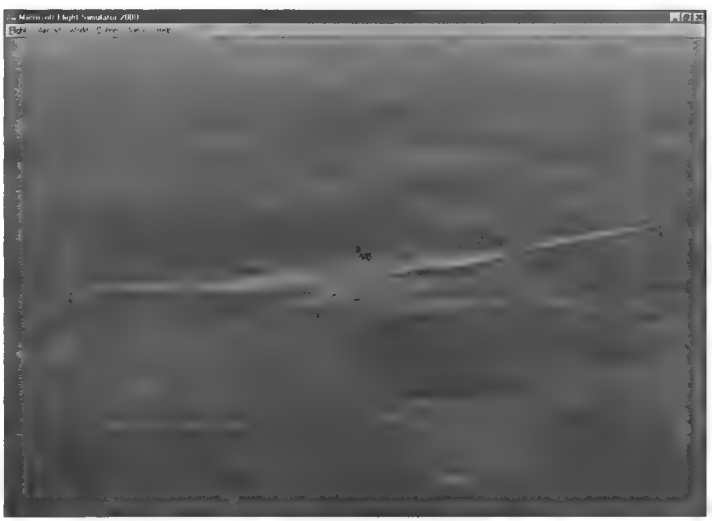


Figure 11-4
Long, easy turns allow you to change direction without dropping out of the sky.

Figure 11-5
When you're this close to terra firma, rock your sailplane into position before you run out of room.

Figure 11-6
Moments later, you are on course and ready to settle onto the runway.

CHAPTER

12

In Search of Curry: Boeing 777-300

The Boeing 777-300 claims a number of firsts among passenger jets. From its inception, the Triple 7 set new standards, beginning with the use of a paperless design system called CATIA. A joint product of IBM and French Dassault, CATIA used 3-D solid images to analyze and project the fit and finish of every part in the airplane.

Boeing's digital design carries into the cockpit, where pilots manage the first all-digital instrument panel. A sophisticated computer system, powered by three 32-bit microprocessors, interprets cockpit maneuvers and translates and analyzes every action. Built-in safety systems, including automatic stall protection, set new standards in electronic monitoring.

The world's biggest twin-engine jet also boasts the most powerful passenger jet engines, capable of over 100,000 pounds of thrust. Matched with a fuel capacity of over 45,000 pounds and a maximum range of 5,600 nautical miles, the Triple 7 comfortably takes on its role as heir-apparent to the 747. OK, enough build-up, let's roll this behemoth onto the runway and stretch its wings.

PLANNING THE FLIGHT

Our 3,907-mile flight from Rome to Calcutta will let us stretch the Triple 7's wings, but it still falls almost 2,000 miles short of the airplane's maximum range. More importantly, it gives a chance to chow down on some Bermi Puri, Tamarind Rice, and Kadhai Paneer at our favorite restaurant in Calcutta. We desire a night takeoff, so click on World, and then Time and Season, to adjust the time for an evening departure from Rome.

Click on Flights, then Flight Planner, and input a Rome-to-Calcutta itinerary that departs from runway 16R from Fiumicino Airport in Rome and arrive at Netaji Subhas Chandra Bose International Airport in Calcutta. We'll fly an IFR flight plan with GPS routing.

PREFLIGHT

Where did all the gauges go? The all-digital instrument panel of the 777 (Figure 12-1) takes some getting used to, especially after finally learning where everything is on the 737.

The primary flight display (PFD) on the left incorporates all the main flight and navigation instruments into one display. From left to right, you have the speed tape, attitude indicator, and altimeter. The heading indicator is on the bottom. As you can see, the presentations are totally different from the other planes, so it's a good idea to study each one before takeoff and make sure that you know where to look for important flight information.

The right side, which contains the EICAS, is less cluttered. The horizontal situation indicator (HSI) is the default display, but you can alter the presentation by turning the knob from GPS (our flight) to NAV (VOR indicator).

Flip the right knob to change the selector from ND to EICAS to display engine and flaps gauges. One more turn to EICAS2 displays the remaining engine gauges, including oil pressure, temperature, and fuel flow (Figure 12-3).

Figure 12-1
The 777 instrument panel seems bare, but you can change instrument sets by adjusting the knobs below the large engine instrument and crew alert system (EICAS) display on the right.

Figure 12-2
Switch the knob below the display to NAV when flying a VOR flight plan.

Figure 12-3
The familiar gauges are there; just flip the knob to find them.

After orienting yourself to the instrument panel, check your preflight settings. The takeoff safety speed of 162 is already visible at the top of the EICAS, along with your heading of 080. Open the Throttle Quadrant (airplane icon button above the heading indicator) and set Flaps 5 for takeoff. Because you're using GPS, there's no need to set NAV radio frequencies.

Moving to the autopilot panel on the top-right side of the instrument panel, flip the flight director (FD) switch on. Continuing your scan from left to right, leave the Auto Throttle switches alone because you're not using TO/GA on takeoff (see Qualifying Flight #2: Boeing 737-400 in chapter 7 for more information on TO/GA). Although the autopilot is not activated for takeoff, you can input a cruising altitude of 19,000 feet by clicking on the digital display under ALT.

Finishing your preflight panel check, set the Auto Brake switch (lower-right corner) to RTO, which will induce automatic braking on a rejected takeoff if your airspeed is above 85 knots. Moving to the other corner of the panel, flip your BCN (beacon) and STRB (strobe) lights on, and we're ready for takeoff.

Takeoff

Release the parking brake and advance the throttle to 1.34 EPR (engine pressure ratio) (don't forget to change right display to EICAS). When the engines stabilize (this occurs quickly), increase to maximum throttle and keep the plane centered as it rolls down the runway. Watch the speed tape on the left side of the PFD, and pull back on the stick to 10 degrees (Figure 12-4). After verifying positive climb (Figure 12-5), retract the landing gear and then go to flaps 1 at 1,000 feet. You're on your way to Calcutta!

Figure 12-4
The 777 is climbing at 10 degrees.

Figure 12-5
Calcutta here we come!

TIP

If you're dangerously close to the mountains when you exit Slew mode, go back to Slew mode and tap Q a few times to increase altitude. Your altitude changes rapidly, so don't walk away from the computer or you may be bumping heads with a space shuttle when you return. Input the new altitude setting in the autopilot immediately when you deactivate Slew mode or your plane will dive to its old altitude!

CLIMB

Continue accelerating to 210 KIAS, then retract the flaps completely. Pull the power back to 95 percent N1 and continue climbing at approximately 250 KIAS to 10,000 feet. Once past 10,000 feet, trim the nose to maintain 320 KIAS on your way to 19,000 feet.

CRUISE

Now it's time for the autopilot to earn its pay. With 19,000 feet already set as your altitude, engage the autopilot and click the NAV button. The 777 will adjust to the GPS course heading to Calcutta and maintain the cruising altitude while settling in to a comfortable 310 KIAS. After a few adjustments by the AutoPilot, you should be locked in and on your way.

You are flying at night most of the way, and thanks to the slewing command, you don't have to stare at your computer screen for eight hours until you reach India. However, because your flight takes you across the Himalayas, an altitude of 19,000 feet doesn't seem so high when you pull to within about 700 miles of Calcutta (Figure 12-7). Unless you want your flight to end abruptly, dial in a new altitude of 32,000 feet (Mt. Everest is 29,000 feet!) *before* you press Y for Slew mode. The scenery is spectacular from here to Calcutta, so you might want to use your view modes and enjoy the sights.

The GPS plots a course at a 90 degree angle to the beginning of the runway. Obviously, your 777 would have a tough time making the turn at that point, so dial in a new heading of 180 degrees that will put you on the downwind leg, parallel to your landing path. Don't forget to click on HDG on the autopilot panel, or the airplane will continue following the NAV heading to the airport. When within a couple hundred miles of Calcutta, you are safely over the Himalayas, so drop down to 19,000 feet as you make your course correction to 180 degrees. Your new heading takes you south toward the Bay of Bengal (Figure 12-8). *Don't for-*

Figure 12-6
More than 3,000 miles to go. Slewing anyone?

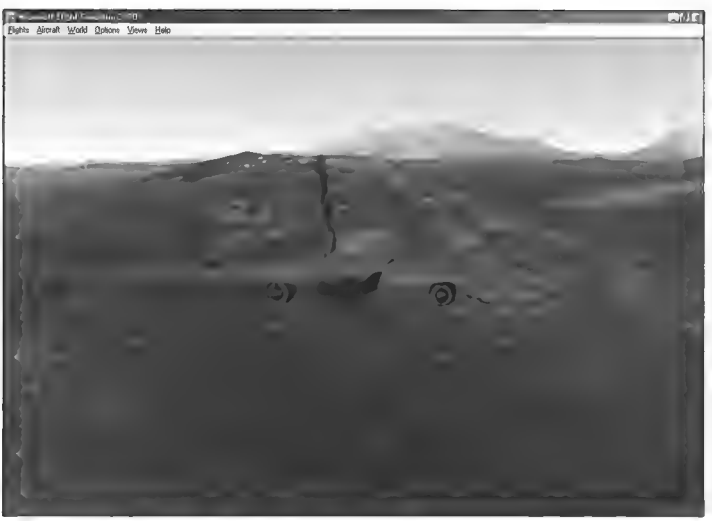


Figure 12-7
OK, who put the mountains over here?

Figure 12-8
After turning to a heading of 180 degrees, the Bay of Bengal and the Indian Ocean loom in the distance.

get to throttle back as you descend during your course correction, or you'll get an overspeed warning.

DESCENT

After the previous heading change, you must turn right, before reaching the water, to a heading of 270 degrees for the base leg. You should be about 60 miles from the airport, a perfect spot to begin your descent to 10,000 feet. One more right turn to heading 017 (check your GPS, your actual heading may be different) puts you on the final approach leg. Your goal here is to reach 10,000 feet when you are no closer than 20 miles to the airport.

By the time you reach 10,000 feet, you should be aligned with the runway (check your GPS). This is a good time to disengage the autopilot, because you will undoubtedly need to make minor

corrections as you approach the airport. At 15 miles from Calcutta, reduce your speed to below 220 KIAS and extend Flaps 1.

At this point you should be at idle speed, so from here on in, make speed adjustments with pitch, not the throttle. Continue descending, reduce your speed to 165 KIAS when you reach the 10-mile mark, and apply flaps 15. Arm the speed brakes on the throttle quadrant, so they will deploy automatically when you touch down on the runway.

When you lock into the glideslope, go to Flaps 30 and maintain your final approach speed of 140 KIAS. Stay centered on the runway and watch the VASI lights to adjust your pitch. The 777 pictured in Figure 12-9 is lined up, but a little high, as reflected by the four white lights (the lights should be red and white). Not to worry, you can still touch down a little long (Figure 12-10). The speed brakes will deploy automatically, and you shouldn't have

Figure 12-9
Coming in a tad high, but straight as an arrow.

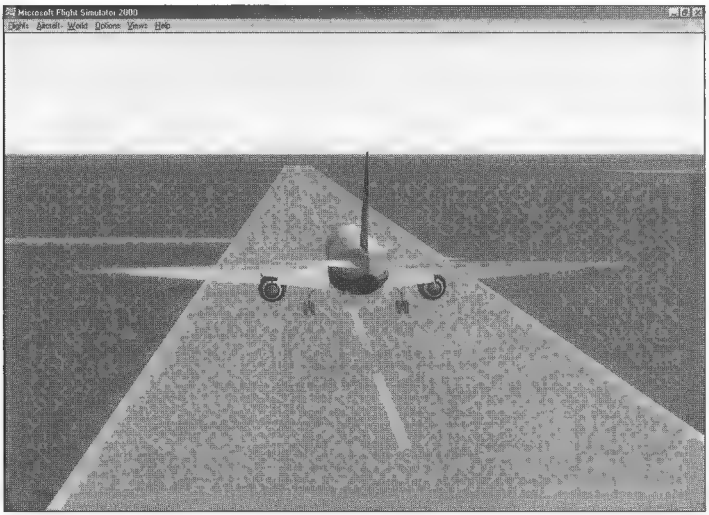


Figure 12-10
You spilled nary a drop on that landing!

any trouble slowing the big plane down on the long runway. You can tool around looking for a good place to park the 777, but, since you don't want cold curry and puri bread, you'd better set the parking brake, grab a taxi, and head for an evening of gastronomical delights in Calcutta.

CHAPTER

13

Rocky Mountain High: Mooney Bravo

This high-altitude, high-temperature flight will tax the performance of even the sleek and powerful Mooney Bravo. At high altitudes, the air is thinner. Because airplanes rely on air pressure to generate the lift that keeps them airborne, thinner air means less lift. Compounding the situation in this flight is a hot, summer day. As a gas (air is a composition of various gases) gets hotter, it expands. If it's not in a sealed container (air isn't), less air takes up more space, and that means even *lower* air pressure. With both heat and high altitude working against you, you must be very careful on this flight over the rugged peaks of the Rocky Mountains.

SADDLE UP

Open up the Flight Planner window from the Flights menu and enter in a flight originating on Runway 7 at Denver International Airport. Select Salt Lake International Airport in the destination box, on Runway 17. Complete the flight plan to give you a nice GPS track to follow over the Rockies. Now open the Time & Season menu and order up a summer day. Next, open the Weather menu and click on Advanced Weather. Create a layer of cumulus clouds between 7,500 and 9,000 feet for some scenic mountain peak peek-a-boo. Finally, click on the Temp/Pressure tab, and raise the temperature to a sweltering 100 degrees. Throw on a parka and splash some water on your neck and forehead if you want to go the extra mile for the sake of realism. We don't condone heat lamps near the computer, though.

Because of the low air pressure outside, put your flaps down for takeoff. Also, run your mixture full lean to account for the thin air by pushing the mix lever all the way forward. Throttle up and begin your takeoff roll. Increase all of your standard airspeeds by ten to twenty percent, again in consideration of the low air pressure outside. Rotate around 75 KIAS instead of 60, and try to maintain about 90 KIAS in your departure ascent.

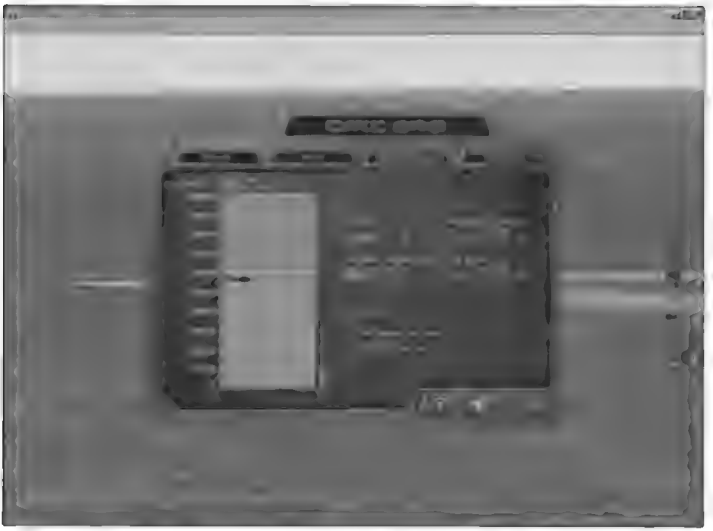


Figure 13-1
Use Advanced Weather menu to dial in some oppressive temperature conditions.

Figure 13-2
Rotating at 78 KIAS with flaps fully extended for extra lift.

CROSSING THE MOUNTAINS

Watch your airspeed carefully on the ascent and keep half an eye on your temperature gauges, too. As soon as you reach a safe altitude, throttle back to avoid running your engine hot on this already-hot day. Cut the throttle back about 10 percent after attaining 2,000 feet AGL, which works out to a little over 7,000 feet above sea level around these parts. Continue climbing more gradually, aiming for 90 KIAS as you gain altitude. Vector in on your GPS track now that you're clear of the airport.

Enjoy a long and scenic trip over the Rocky Mountain range along your GPS flight path. Climb up to FL 150 (flight level 15,000 feet), which is high enough to avoid even the tallest peaks. Dial in the autopilot and take off that parka (your plane has air conditioning, after all) as you settle in for the long ride to Salt Lake City. Because of the harsh conditions, you won't get quite as much airspeed today as you may be accustomed to seeing in the

Figure 13-3
Sit back and enjoy the scenery on your way to Salt Lake City.

Mooney. Many people would opt against a flight on a hot day from a high altitude airport, but that's part of the allure of the flight simulator; you can always hit reset.

As you approach Salt Lake, you'll probably pass over Park City, nestled high in the Wasatch Mountains. Salt Lake is the site of the 2002 Winter Olympic Games, and you may be able to spot the gigantic ski jump at Park West. Begin descending to 13,000 feet over these ski resorts. You'll be surprised by the sudden and dramatic dropoff the mountains make at the edge of the Salt Lake Valley. Make your way across the southern end of the valley, descending in earnest for your approach to Salt Lake International.

Shoot for a landing on Runway 35, which orients you toward the Great Salt Lake on your approach. Land at about 80–95 KIAS and with full flaps. That's a little fast for a normal landing in the Mooney, but you'll feel like your sink rate is exactly the same due to the low air pressure. Execute your flare early, as your control

Figure 13-4
The dropoff of the Wasatch front is beautiful and dramatic.

Figure 13-5
Landing with the Great Salt Lake in view. Its predecessor, Lake Bonneville, was directly responsible for those dramatic mountain fronts in the previous figure.

response is a bit more sluggish than usual. When all three feet are on the ground, reduce your throttle and brake as normal. Taxi off the runway to complete your challenge in the thin air amidst the Rocky Mountains.

CHAPTER

14

Manhattan Mission: Bell JetRanger III

Piloting a helicopter requires a skill set completely different from that used for piloting fixed-wing aircraft. The first major difference between fixed- and rotary-wing aircraft is that thrust is offset from a horizontal orientation to a vertical one, and that's a big change. No longer must you maintain forward speed to remain aloft—indeed, a helicopter can hover in midair, and may even travel backward. Do not be misled into believing you'll have it easy, however; the opportunities to get yourself into trouble in a helicopter are probably more numerous than those of an airplane!

HELICOPTER CONTROLS

The JetRanger in *Microsoft Flight Simulator 2000* features a relaxed helicopter flight model. This is fine, because a whole other book could be written on the finer points of helicopter piloting. Thanks to the simplified flight model in *MFS2000*, you can start buzzing around your favorite metropolis in no time.

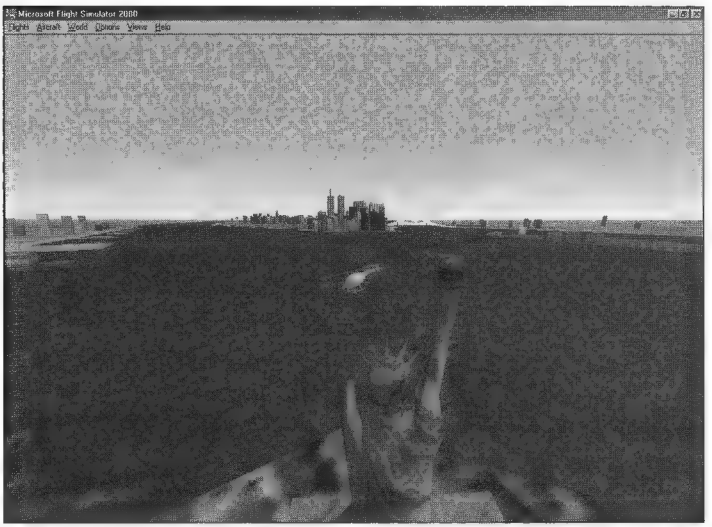


Figure 14-1
Buzzing around Lady Liberty as a fly would around a normal-sized person.

The Collective

Say goodbye to your throttle; it's gone in a helicopter. In its place, you have the *collective*. This name might sound like something out of popular science fiction, but it refers to the combined control for the helicopter's engine power and the pitch of the rotor blades. Apply more input on the collective, and you ascend. Lower your collective, and your helicopter begins dropping toward the ground.

NOTE

The collective will seem reversed to experienced helicopter pilots. Normally, pulling back on the throttle translates to pulling up on a real helicopter collective. In *MFS2000*, the throttle replaces the collective, so pushing forward on the throttle controls increases your collective.

Moving Forward

Your helicopter's forward movement is controlled by the stick. Pushing forward on the stick points your nose down toward the ground, just like in a plane. With your nose down, the lift vector created by your rotors is tilted forward, thus pulling you forward through the air. The farther forward you tilt, the faster you move forward.

Helicopters generate little or no lift from forward movement, however, so you must increase your collective in order to maintain

Figure 14-2
Tilt your nose forward to accelerate, but don't tilt too far forward, or your rotors won't be able to keep you in the air!

your altitude as you accelerate; you must overcome the shortened vertical component of your forward-slanted lift vector. Try to go too fast, and you'll eventually fall more than you fly and will send your helicopter plunging to the ground.

Turning

TIP

Do not overcorrect in a hover. Make all inputs in very small, smooth increments. Plan on erring on the side of undercorrection; you can always maintain a correction longer than you planned, or add a second gentle maneuver to finish compensating for drift. If you yank the stick you'll begin to porpoise all over the sky!

Turning a helicopter is accomplished in much the same way as turning an airplane. Pushing the stick in one direction banks the helo in that direction. Stepping on the same side's rudder pedal pushes your nose around the bank and changes your heading. This only works when moving forward. When standing still, tilting sideways is similar to pushing forward; you'll start sliding sideways through the air. If you do this too long or too fast, the poor aerodynamics of your silhouette will begin to make your chopper very unstable, and you risk crashing. To bring your nose in line with your movement, merely step on the rudder pedals into the direction of travel.

Hovering

Easier said than done, hovering requires you to carefully coordinate your aircraft's controls. The helicopter naturally tends to "fall off" a stable attitude, requiring constant inputs to correct for drift. If you fade left, bank right. If you drift upward, drop the collective. If you find yourself spinning right, gently push the pedals to the left. You can maintain a hover for a few minutes, but as you remain on station your helo becomes increasingly unstable, and your engine may begin to overheat.

A NIGHT ON THE TOWN

This challenge-based flight has you combing the streets and sweeping the skies in maneuvers typical to the daily lives of law-enforcement helicopter pilots.

Helicopters are ideal for police work because of their ability to bypass ground obstacles and interference, which maximizes

response and pursuit times. They can observe large areas clearly, which helps them acquire and maintain contact with suspects. Their observation capabilities also endear them to their ground-bound brethren, who benefit from the coordination and communication an officer in the air can provide. Unlike airplanes, they can remain on station and travel at low speeds, helpful for maintaining a visual on a ground target or navigating tight metropolitan areas. You can experience these attributes in action on your night shift in the skies of Manhattan.

NOTE

This scenario requires you to turn up the dynamic scenery to its maximum settings. Without it, you'll never see anything to interact with.

Reporting for Duty

As a new pilot for the NYPD Air Unit, the first thing you must do is show up for work. Jump to La Guardia airport, and start on Runway 22. Here, you are pointed roughly toward the Big Apple when sitting on the runway. Once you're settled on Long Island, hop into a Bell 206B JetRanger. Use the World menu to set up a night flight—Manhattan is always more fun at night!

Figure 14-3
Ready for takeoff at La Guardia Airport. Downtown New York lies ahead and to the left.

Gently pull up on your collective, and you'll hear the engine rev up while the blades take a deeper chunk out of the air. At about 70 percent torque, your nimble little craft practically leaps into the air. Gain about ten feet of altitude, and then push the nose forward about twenty degrees to gain some stabilizing forward airspeed. Even though a helicopter doesn't need to keep moving to generate lift, forward motion provides airflow over the body and stabilizers, which helps the pilot maintain control of the aircraft.

Continue to gain airspeed as you raise your throttle to 100 percent on the torque indicator, which is the second gauge from the left on the top row of the instrument cluster. You can exceed 100 percent at times, but it should be reserved for emergencies to avoid overheating and stressing your engine.

As you fly, you'll note some very important connections. The more you pitch forward, the faster you go. The faster you go, the more collective input you need to avoid falling. Eventually, you can't pitch forward anymore without losing altitude, because you run out of collective. Again, this is due to the tradeoff a helicopter

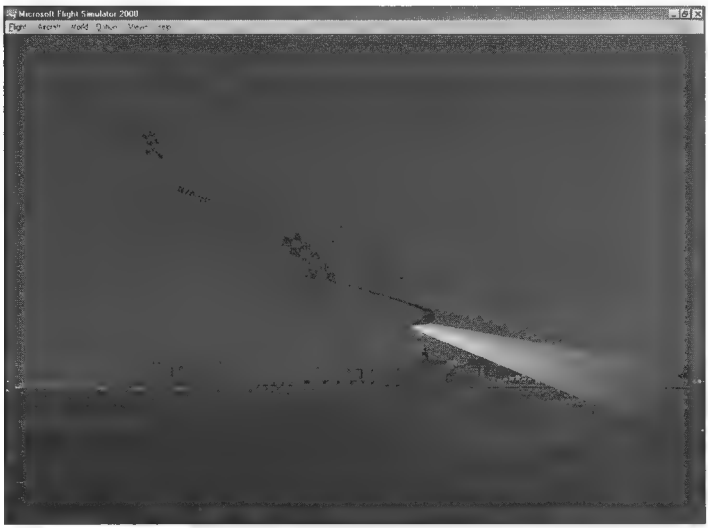


Figure 14-4
Pitching forward to gain some airspeed after takeoff.

makes in lift for airspeed, and it's important for you to grow comfortable with the trades you can make in airspeed for lift and vice versa.

Head out along the runway heading until you encounter the massive industrial stacks on the riverbanks. Pass the industrial area of the Kings borough, then take a left over the water. Spread out before you are the glittering lights of New York City (Figure 14-5). Head down the waterfront, crossing over the Triborough Bridge as you do so. Drop down to about 400 feet AGL, just enough to clear the top of the bridge. Take a right and follow the bridge to its northern side. As you exit the bridge ramp area, watch carefully for the first car you see leaving the bridge. This will be your "suspect. " Follow the headlights down the road, centering the vehicle in your searchlight with the L key, and try to light the way for squad cars to apprehend the perp.

Once the car's lights turn off, you know your friends on the ground have apprehended the suspect. Turn back to the west, toward the other bridges (you'll pass over several between

Figure 14-5
The shimmering skyline of New York, New York. If you can make it there, it probably just means you have GPS, so you could make it anywhere.

TIP

If you ever find yourself in trouble in a helicopter, the nearly universal solution is to pull up hard on the collective while simultaneously pulling back on the stick. This will bleed off your forward speed in a hurry, thus diverting all of your engine power to climbing as you slow down.

Figure 14-6
Just off the Triborough Bridge, and we've spotted a vehicle that matches the description of an armed robbery suspect's getaway car. The chase is on!

TIP

Remember, when you play chicken with the terrain, you always lose.

Manhattan and Long Island). Continue down the channel until you see the very last set of bridges, sitting very close together and near the end of the island. The second crossing is the famous Brooklyn Bridge. Turn right and head downtown. Stay low and use your light to search the streets for any suspicious activity. Watch your speed, and more importantly watch out for the sides of buildings.

When you're finished sweeping the streets, climb out of the sewers and head for the rooftops. Patrol the airspace above New York for low-flying aircraft violating the altitude ordinance. It won't be long before you find a joker who just had to take a joyride over Central Park. Chase down the offender, and record his tail numbers. This requires some hot piloting, because even basic light aircraft can outrun your helicopter at its top speed.

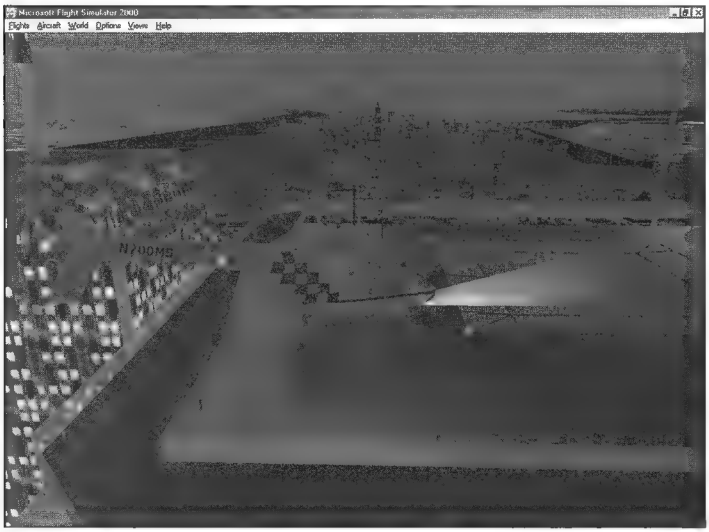


Figure 14-7
Setting down atop the World Trade Center.

After keeping the skies safe above New York, it's time for a coffee break. The World Trade Center has a great little restaurant on the top floor, so fly out to the end of the island for a rooftop landing. You must be very careful to set down on the helipad marked on the roof. Zero your airspeed by the time you touch down. Success means another good night of guarding Metropolis against evil and villainy.

CHAPTER

15

Home for Christmas: Learjet 45

INTRODUCTION

Christmas in Chicago is a sensory delight, especially when a soft, evening snow is falling on Michigan Avenue amidst twinkling lights, while the distant melody of happy carolers warms the chilly air. Of course, the tune is slightly different for a Learjet pilot who has the unenviable task of leaving San Diego and arriving at Meigs Field in the middle of a snowstorm. Our final theme flight is a test that will challenge the best of pilots. The Lear is difficult enough to fly on a sunny day. When you throw in freezing temperatures, wind, and snow, it's criminal. Without further adieu, let's go straight to San Diego's Brown Field. It's 82 degrees and sunny, but that will change.

CAUTION

A word of caution about the Learjet autopilot: Do not walk away from your computer until you have a steady climb and stable acceleration. It is not uncommon for the AP to go off on its own in this flight model. If the plane goes into a dive or excessive climb, you must manually adjust the elevator trim, and/or throttle to settle the plane down. Your goal for the climb to 40,000 feet should be a conservative climb rate of 5 degrees at about 250 KIAS. Remember to increase power as the air thins out above 25,000 feet.

GOOD MORNING MR. LEAR

After climbing into the cockpit, your first job is to do something about the weather. Click on World, then Weather, and then click Real-World weather to download current global weather conditions. The forecast for San Diego is broken clouds, 10 miles visibility, and light winds out of the east. You'll adjust the weather as the Learjet approaches Chicago, just to make things interesting.

For now, let's prepare for takeoff. Run through your preflight checklist. Because this is a GPS flight, your route is locked into the autopilot when you flip the NAV/GPS switch to GPS. You will engage the autopilot after your initial climb, at which time the plane will automatically adjust its heading for Chicago. Arm your spoiler (Throttle Quadrant), set Flaps 8, and dial in a cruising altitude of 40,000 in the ALT window of the AutoPilot Panel. That's it; let's roll.

TAKEOFF AND CLIMB

Your rotate (takeoff) speed in the Learjet is 125 KIAS, so push the throttle to full, keep the plane centered, and accelerate. The Learjet has a tendency to go vertical immediately after takeoff (Figure 15-1) no matter how your initial pitch trim is set, so be prepared to

Figure 15-1
The Learjet is like a wild stallion on takeoff, so be prepared to tug on the reins.

push the stick in to control ascent to 10 degrees on the attitude indicator. This is extremely important! If you over-rotate on the initial climb, the plane will stall, become extremely unstable, or if the angle is severe enough, jam its tail into the runway. Retract flaps at 165 KIAS, and then check your autopilot settings:

FD (flight director)—ON

NAV button—ON

ALT (altitude)—ON

ALT Setting—40,000

AP (autopilot)—ON

CRUISE

The flight manual states that the Learjet cruises at .77 Mach, settling in at about 280 KIAS. If the overspeed buzzer keeps blaring, check to make sure that you have dialed in the proper autopilot

speed setting. Click the IAS button to lock in KIAS (knots indicated air speed), or the MCH button for Mach, but don't mix up the two values. With the IAS button activated, and a speed of 280 in the window, your Learjet will lope along effortlessly at 61 percent power on N1 up to 10,000 feet.

Once things settle down in the cockpit, you can check out the sights at 35,000 feet. Except for a thick cloud cover below (Figure 15-2), there isn't much to see, so it's a good time to slew your way to the Great Lakes. Tap [Y] to invoke Slew mode and pull to within 150 miles of Chicago. Just be prepared to jump in and stabilize the Lear after you exit Slew mode.

CAUTION

Pause the simulator before going to Map View, or you might return to some bizarre settings. It is not uncommon to look at the World Map and then come back to find a 100 KIAS drop in speed.

CHICAGO APPROACH

As you fly to within 300 miles of Chicago, you'll be somewhere over Iowa. The Real-World weather shows wind out of the south, but no precipitation. We can't have such boring conditions for the remainder of your flight, now can we?

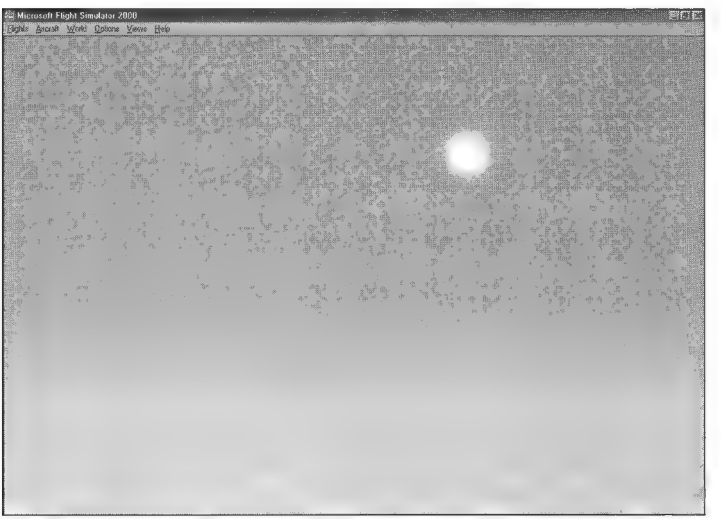


Figure 15-2
The fluffy clouds sure are pretty. But, I wonder what's going on underneath them?

Go to the Weather window and click Clear All Weather to remove the Real-World conditions. Then, select Broken clouds, Very High precipitation, 20-mile visibility, Heavy wind strength, and 360 degrees for wind direction. Click Stratus clouds, Broken (7/8) cloud coverage, Moderate icing, Moderate turbulence, Snow with a base altitude of 1,500, and a Very High rate. Click on the Temperature tab and throw in a few chilly layers. This part is up to you, just as long as you don't go above 0 until you drop below 1,000 feet. Now, you can prepare for approach.

Using the 3/1 rule (3 miles distance per thousand feet of altitude), begin your descent from 35,000 feet. If you switch off the autopilot, maintain a speed of 250 KIAS, a descent rate of 2,000 feet per minute, and N1 thrust set at 53 percent. *Remember not to exceed the 250 KIAS limitation below 10,000 feet*! Even with the autopilot engaged, you might need to make several speed adjustments on the way down. The GPS should have you lined up for Meigs Field, but don't be confused by O'Hare Airport coming up on the left on the GPS display (Figure 15-3). Meigs is ahead, just

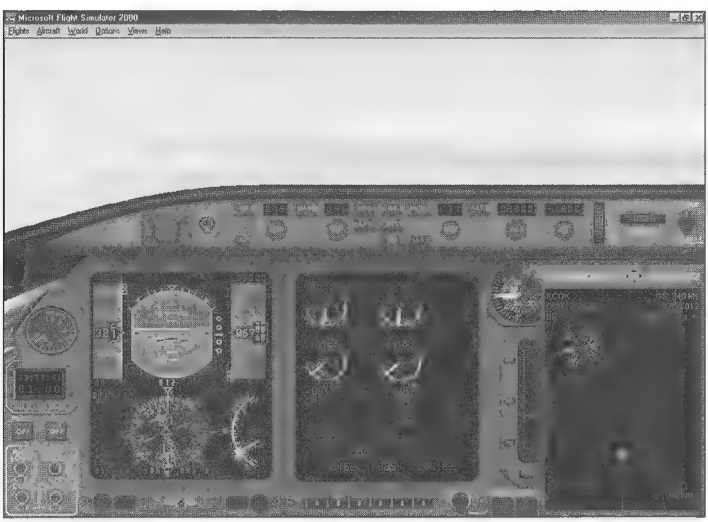


Figure 15-3
If you land at O'Hare, you'll have a long walk to Michigan Avenue.

to the left of your current heading, and nestled on the edge of Lake Michigan.

You'll have zero visibility when you enter the stratus cloud layer at around 6,000 feet. Things will get rather bumpy as you emerge from the clouds at around 2,500 feet to see downtown Chicago off to your left Figure 15-4). Continue descending but watch your speed; the airport is just a couple of miles away. When you pass 1,500 feet, a driving snowstorm should begin pelting your jet, but the snow is less of a problem than the northerly wind that will make your upcoming left bank a bit more challenging.

Meigs Field is southeast of downtown, sitting on a short (the key word is *short*) jetty in Lake Michigan. If it were further out in the lake, your landing would be a snap. But, the airport is very close to the shoreline, and, due to a short runway, you must land close to the numbers or you'll roll off the end and into the water.

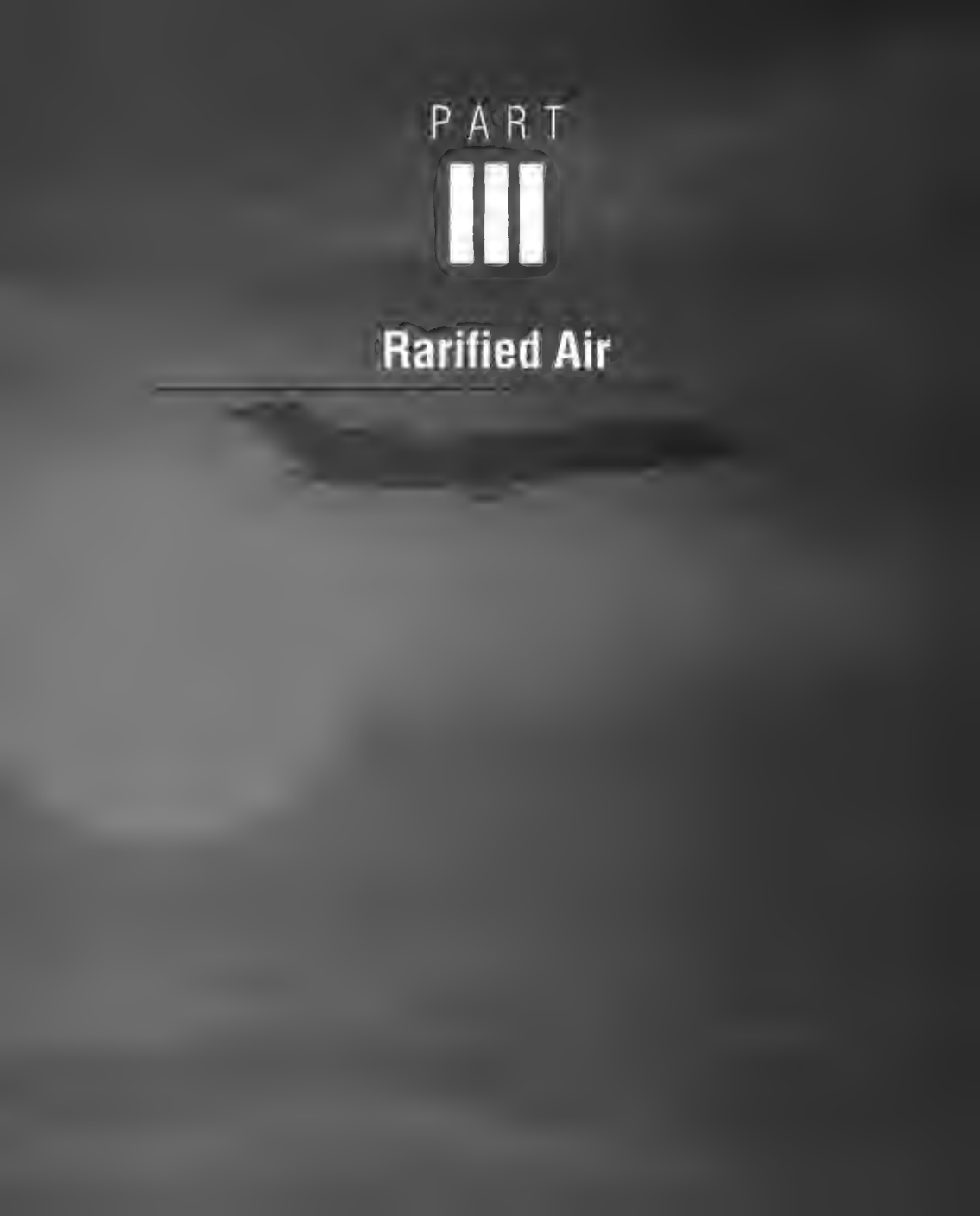
You should be off the autopilot by now and paying close attention to your speed and angle of descent. When you are lined up to the runway, extend 8 degrees of flaps and bring your speed down

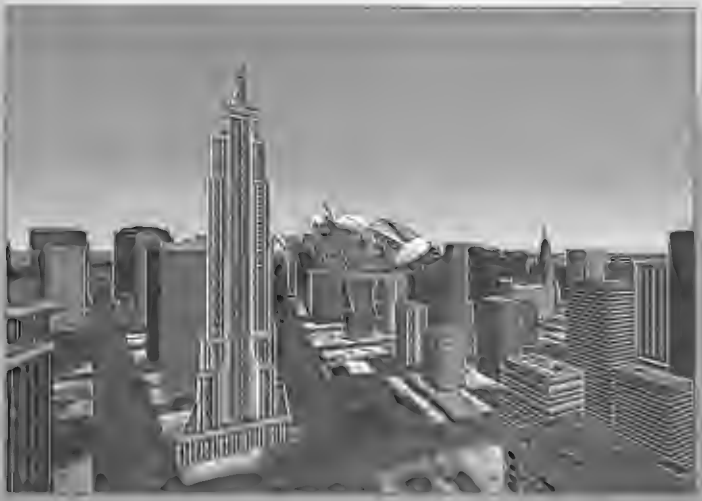
Figure 15-4
Line up well to the right of the clustered apartment buildings to give yourself enough room for your left bank to heading 360.

to 180 KIAS. When you first see the airport off to the left, begin your left bank to 360 degrees. When you center the plane on the runway, lower the gear, and put down flaps 20. Maintain your pitch (the additional flaps give temporary lift, so apply downward trim), and keep watching your speed.

You're almost home. Extend full flaps to slow the Lear down to 140, which is your optimum speed for landing. At 50 feet above the runway, pull your throttle back to idle and set your plane down on the numbers (Figure 15-5). Deploy the spoilers on touch down (if you armed them, it will happen automatically), and then release the spoilers when your speed drops to 60 KIAS. Apply the brakes firmly, and come to a stop before the end of the runway (unless you outfitted the Lear with pontoons before leaving San Diego). Park your plane and take a taxi to Michigan Avenue. You don't have to worry about the snow anymore, so enjoy a white Christmas in the Windy City!

Figure 15-5
If you touch down near the numbers, you'll have plenty of time to stop your speedy Learjet.

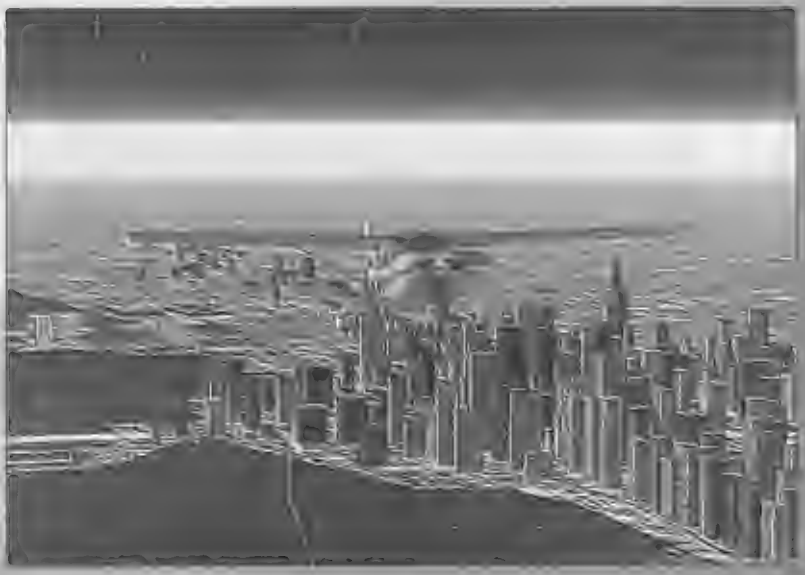

PART
III
Rarified Air



CHAPTER

16

Weather or Not



Microsoft Flight Simulator 2000 adds advanced weather effects, including the ability to download real-world local or global weather conditions from Jeppesen DataPlan. After we explain how the system works, we offer tips for setting up weather effects and flying through them. Finally, we take you through a harrowing landing at Schenectady County Airport, courtesy of some real-world, gusty crosswinds at 3:30 p.m. on November 15, 1999. But first, let's discuss weather with our resident 737 pilot, First Officer Hank Stanley.

INTERVIEW WITH 737 PILOT HANK STANLEY

Q: We'll get to the obvious questions about storms and wind in a moment, but what about the seemingly benign aspects of weather, like humidity?

A: Humidity can be a major factor in how an aircraft performs, particularly during takeoff. It effects propeller planes more than jets, and it really does a number on helicopters. It has a negative effect on the props, rotor, or wings. The bottom line is that you might require more speed and/or a longer runway on takeoff. However, the wild card is altitude. If you're taking off from an airport like Portland International, which is just a few feet above sea level, the effect of humidity is not as dramatic. Throw in humidity when you are trying to take off from Salt Lake City at over 4,000 feet—then you have real problems.

Q: Speaking of runway length, if you find yourself in a situation where the weather conditions demand a longer runway, do most airports have a built-in cushion, or is it common to be grounded?

A: Actually, it is fairly common to have a flight canceled because you lack sufficient runway for takeoff. Every certified airplane should have charts that allow you to enter a density altitude value. You would also factor in the expected winds and temperature. For commercial airliners, like the 737, most airports have alternate runways, because it is common for extreme temperature or wind to shut down a particular runway.

Q: What kinds of weather checks do you go through on a 737, and how do you determine changes in flight plan, or even cancellation of a flight?

A: First, we check the visibility requirements for the runway, which is contained on our Jeppesen charts. For example, Runway 27L at O'Hare requires adequate visual reference of 1,600 feet, or about a quarter mile. If the weather drops our visibility below that level, we cannot legally take off, unless we have an alternate runway. Of course, we must have similar clearance for landing, so we look at the destination airport as well.

Our options vary greatly with the airport. In Chicago, they'll just send you to another runway, especially if it is a wind problem. Chicago is extremely windy, so they have runways pointing in all directions. However, San Diego has only one runway. If the winds shift and we have a 90-degree crosswind above 36 knots, we couldn't take off because it would exceed the controllability of the airplane. Even with full rudder, the airplane would still drift off the side of the runway. Fortunately, more than 90 percent of the winds in San Diego come off the ocean, so it is rarely a problem.

Q: We haven't mentioned temperature yet. Does each airplane have a minimum outside temperature certification?

A: Yes. But actually, cold temperatures are rarely a problem. In fact, low temperature is good on takeoff. Engines perform better, and aerodynamically, the airplane works better. High temperature is a factor because it affects takeoff performance so much. Last week I was supposed to take off out of Mojave on a very short runway. It was hot enough that the combination of runway length, temperature, and wind direction forced us to change runways so we could take off from the opposite direction.

Q: I guess that takes us to thunderstorms. We can model all kinds of nasty weather in *Microsoft Flight Simulator 2000*. What can you tell flight-sim pilots about severe weather?

A: The bottom line is, you pretty much try to avoid thunderstorms. During the day when you can see them, it is not much of a problem because you can simply fly around a storm. At night, or

in bad weather, when benign clouds can hide the storms, we depend heavily on our weather radar. Almost all airplanes that fly at night in potentially bad conditions have some sort of weather radar. It produces a terrain map with a color range from green down to red. Obviously, we stay out of the red, and we generally try to fly clear of yellow. However, we must still gather information on wind, turbulence, and temperature, because the radar only tracks visible moisture.

Q: So, you can fly around a storm if you know that it's there. What about storms that come up over or around an airport just before landing?

A: I have seen thunderstorms anchored right over O'Hare that are bad enough to temporarily shut down operations. Aside from the water, a mature storm dumps huge amounts of air as it passes, so the winds can shift dramatically. We try and monitor the weather patterns as we're coming up on a field. If there is a cell a few miles from the field, and it's going to pass overhead while we are already in approach frequency, we depend on the approach controller for additional information; at that point, we're too busy to continually monitor the weather. The approach controller may tell us to go around, or give the cockpit the option to make a decision about continuing the landing or making another pass.

Of course, wind shear is the most dangerous aspect of storms that center over airports. An extreme storm might have a 60-knot headwind coming into it, with the same amount of wind going out of it. So, you pass through a band where you go from a headwind to a tailwind, and you can lose 120 knots of air speed within seconds. This alone can put your airplane in a starve condition. That is why wind shear is so insidious.

Q: What effects do freezing temperatures have on your pre-flight routine?

A: Other than being uncomfortable going through pre-flight in a very cold airplane, everything is normal once the plane warms up.

Of course, if there is precipitation, we de-ice continually before takeoff. This eliminates ice on the wings, and also takes care of snow that can melt while we're on the runway, turning to ice later. We de-ice at the gate, and then taxi out. If you get in a big conga line of thirty jets waiting to take off, you can accumulate more ice, so we normally de-ice again, at the end of the runway.

Q: Have we missed any other extreme weather conditions?

A: Hail is incredibly damaging. In the Navy, we had one of our S-3s coming out of Tucson that had the whole side canopy shattered by large hail at about 21,000 feet. The pilot passed out from the sudden depressurization, so the navigator dove down where the air was denser, and the pilot woke up. Fortunately, the engines were not damaged and they were able to land.

DOING SOMETHING ABOUT THE WEATHER

Microsoft Flight Simulator 2000 provides three ways to change the weather. Because bad weather can make your flight uncomfortable or even impossible, your choice should match your skill level (unless you like spending more time resetting your flight than actually flying). The following sections describe general, advanced, and real-world weather effects.

NOTE

Make basic changes to the temperature, and alter sunrise and sunset times, by clicking on World, then Time & Season. Change the date and time of day, or simply choose a new season in this menu, too.

General Weather Effects

By default, *MSF2000* gives you a clear day with 30 miles visibility and no wind, which is a perfect environment for learning how to fly. But, as real pilots know, the weather is rarely perfect. In the opening Weather screen (figure 16-1), you can make adjustments to clouds, visibility, wind strength, and wind direction. Precipitation is grayed-out until you change the cloud setting from Clear. By selecting Global, your changes effect your entire world. A Local setting only effects the current reporting station (name highlighted in red on the map).

Figure 16-1
The opening Weather screen lets you make simple changes to your environment.

Real-World Weather

If you have an Internet connection (MSN server is not required, despite what it says in the help file), click on Real-World Weather to download up-to-the-minute local or global weather from Jeppesen. After download, the information is loaded into your current flight (figure 16-2). After such an update, we now face heavy winds from the north, only 10 miles visibility, and scattered clouds for our takeoff from Meigs Field in Chicago.

TIP

To access advanced cloud effects, you must set Clouds to a value other than Clear in the opening Weather window.

Advanced Weather

For ultimate control over every cloud, gust of wind, and raindrop, click Advanced Weather to adjust Clouds, Wind, Temperature/Pressure, and Visibility. Each tab on the Advanced Weather window Figure 16-3) contains a wide variety of settings that let you fine-tune all weather effects, or focus on a particular factor. The following sections include instructions for creating ground fog and thunderstorms, and tips for dealing with sudden icing.

Figure 16-2
What happened to our clear day in Chicago?

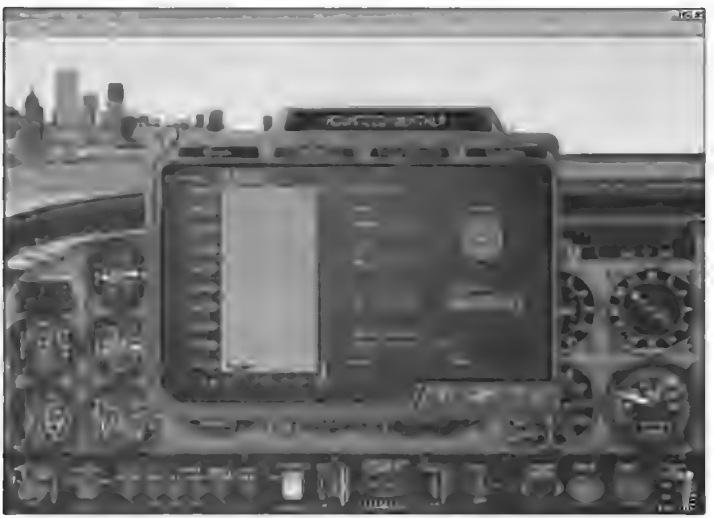


Figure 16-3
The Wizard of Oz has nothing on you, once you open the Advanced Weather window.

CAUTION

Don't forget to verify that your destination airport is ILS-equipped before attempting a landing in heavy ground fog.

Ground Fog

1. Open Advanced Weather and click on the Clouds tab.
2. From the Coverage box, choose Overcast.
3. Under Base, click on the arrows to match the elevation of your current airport.
4. Under Top, set a value equal to your base elevation plus 1,000.

Thunderstorm

1. Open Advanced Weather and click on the Clouds tab.
2. Select Thunderstorm under Cloud Type.
3. Under Cloud Coverage, choose Overcast for a massive storm.
4. Set the Cloud Base and Tops at the settings of your choice.

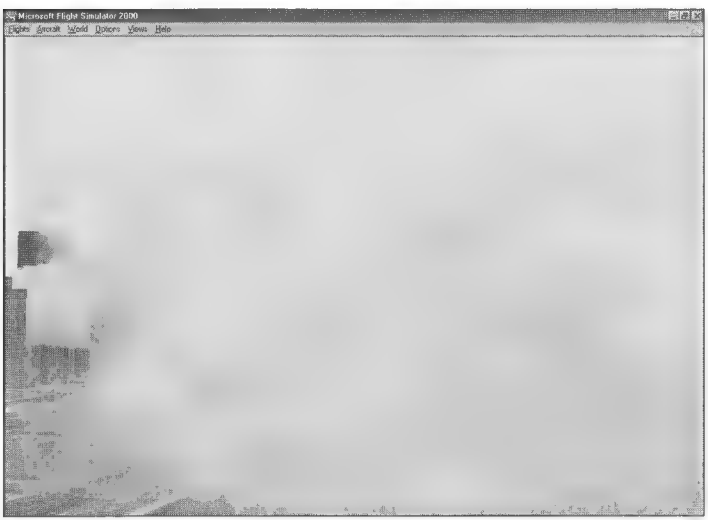


Figure 16-4
The Hancock Building is barely visible through the low clouds over downtown Chicago.

5. For added effect, set Turbulence at Severe and Precipitation Rate at Very High.
6. Fly through the thunderstorm for a wild ride (Figures 16-5 and 16-6).
7. If you get on top of the storm, tune in your next VOR, or use GPS to stay on course, because you can't see the ground from here (Figure 16-7).

Icing

These tips help you recognize, and then adjust to, icing during flight.

- Be alert for a drop in manifold pressure or a change in the sound of your engine. Either of these conditions may precede a series of momentary stalls.
- Look for a sudden gauge malfunction (Figures 16-8 and 16-9).

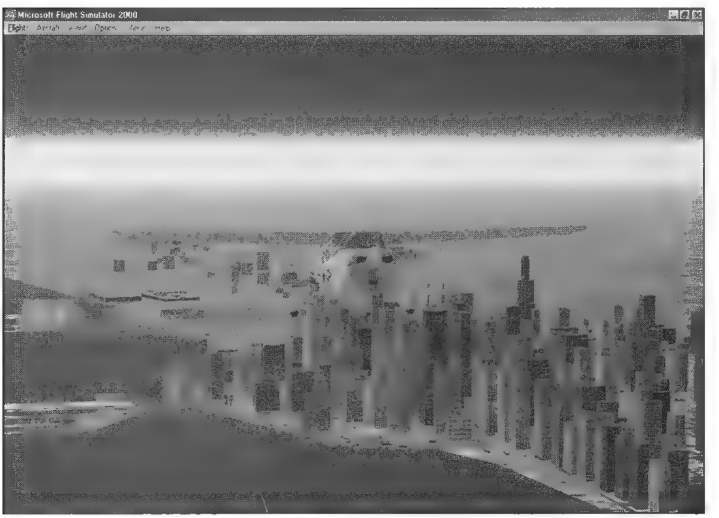


Figure 16-5
A lightning bolt comes a little too close to our Cessna 182S.

Figure 16-6
Nearing 4,000 feet and still climbing; there is no end in sight to this thunderstorm.

Figure 16-7
From above the storm at 8,000 feet, you can still hear the thunder, but the flight is nice and smooth.

Figure 16-8
The propeller is turning . . .

Figure 16-9
. . . but the airspeed indicator is frozen.

- Don't forget the obvious: Look for ice forming on the windshield.
- If icing occurs in the clouds, climb above them, or descend quickly. It helps to know the levels of the cloud base and tops to make the right choice.
- If stalling occurs, increase the throttle as you (hopefully) escape the icing conditions.
- In freezing rain, climb or descend to find a layer of warmer air. Freezing rain always indicates warmer air above.
- Avoid abrupt maneuvers when your aircraft is coated with ice; the aircraft is aerodynamically deficient in this state.
- When "iced up," fly your landing approach with power.

A REAL-WORLD LANDING IN SCHENECTADY

The Real-World Weather option in *Microsoft Flight Simulator 2000* may be the most impressive feature of this sim. Unless you are glued to the Weather Channel 24/7, downloading current conditions can produce some wildly unpredictable flights. On our first real-world flight, we flew from Cooperstown, New York to Schenectady County Airport. Normally, this is a short, uneventful flight. But, thanks to gusting crosswinds, our landing in Schenectady was anything but routine.

With moderate crosswinds during landing, you can point the airplane's nose slightly into the wind to help stay aligned with the runway ("crabbing" is described in detail in chapter 18). This also works in extreme conditions, but it is much more difficult to control the airplane (Figure 16-10).

Another gust blows our plane over the runway, but we are still airborne (Figure 16-11). We are only 5–6 feet off the ground, but the wind is still blowing and we must be careful not to overcorrect.

Amazingly, the wind knocks us to the right again, and now we are slightly right of center and level, just a few feet above the runway (Figure 16-12). Finally, the wind dies down and we settle on the right side of the runway with barely enough room to apply the brakes and roll to a stop. Our first experience with real-world

Figure 16-10
With a strong left-to-right crosswind, we aim our plane to the left of the runway.

Figure 16-11
We are over the runway now, but still way out of position for a safe landing.

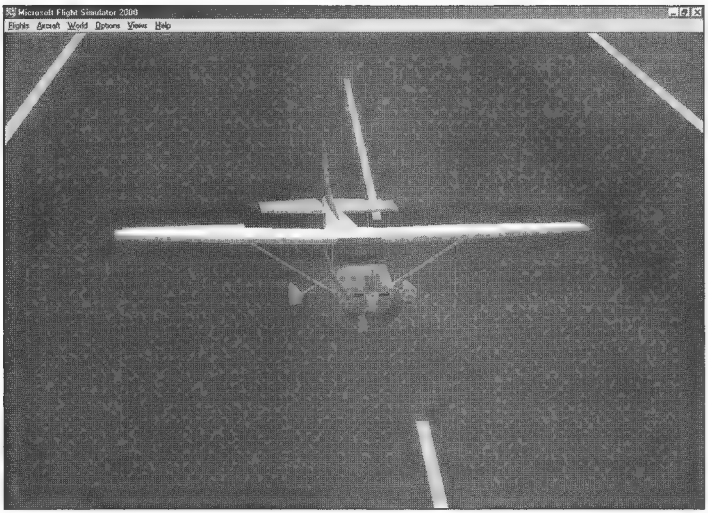


Figure 16-12
If only the wind would stop blowing, we could land this thing and find the closest pub.

weather is an adventure. Had this been an actual flight, we would have been instructed to land at a different airport. But, giving it a try in *Microsoft Flight Simulator 2000* was simply too enticing to pass up.

CHAPTER

17

Emergency

NOTE
For complete descriptions of each instrument or component mentioned below, see Chapter 5: Instruments and Gauges.

Microsoft Flight Simulator 2000 allows you to experience two types of flight emergencies: programmed and pilot error. Set programmed errors under the Instruments, Systems, and Radios tabs in the System Failures window. You may also assign key commands to a number of mechanical failures, allowing you to instantly shut down a critical component of your airplane. In this chapter, we take you through each system and mechanical shutdown, and offer tips for backup procedures.

Pilot errors cover a wide range of situations, but the most common, especially for novice flight-sim pilots, are stalls and spins. We focus on these emergencies and provide proven strategies for bringing your airplane back under control.

SYSTEM FAILURES

Instruments

When you gaze across an instrument panel, you can't help but think that you could reduce the number of gauges and still fly the plane. Actually, you're right. However, you would lose an important safety system that provides critical backup functions. Here are tips for overcoming the loss of each item on the Instruments tab of the System Failures window.

Attitude Indicator

This gauge provides an artificial horizon for monitoring the pitch of your airplane's nose—an obviously critical function for ensuring that you don't nose down straight into the ground. Without this gauge, you can obtain similar, but less-precise information on the VSI (vertical speed indicator).

Heading Indicator

This gyro-driven instrument reports your airplane's heading, or direction. Fortunately, your compass provides the same reading, although it is less precise, and the readout is much smaller (Figure 17-1).

Figure 17-1
By default, your compass is not visible in *MFS2000*. Click the appropriate button on the instrument panel to bring it into view in the event of a heading indicator failure.

Vertical Speed Indicator (VSI)

Lose your attitude indicator? Not to worry; the VSI shows your angle of ascent or descent. Keep the needle on 0 and you're flying level. Lose both, and you must depend on your altimeter.

Altimeter

With the HI and VSI gone, your altimeter tells you that your plane is level if you are holding steady at the current altitude.

Airspeed Indicator

This is the only gauge that measures pure air speed. However, if your GPS system is functioning, you can estimate your speed by comparing the rate at which you are approaching the next waypoint to the time countdown on the ETA (Figure 17-2).

Turn Coordinator

This is a poor man's readout of your plane's attitude. Keep the plane icon's wingtips aligned with the left and right horizontal

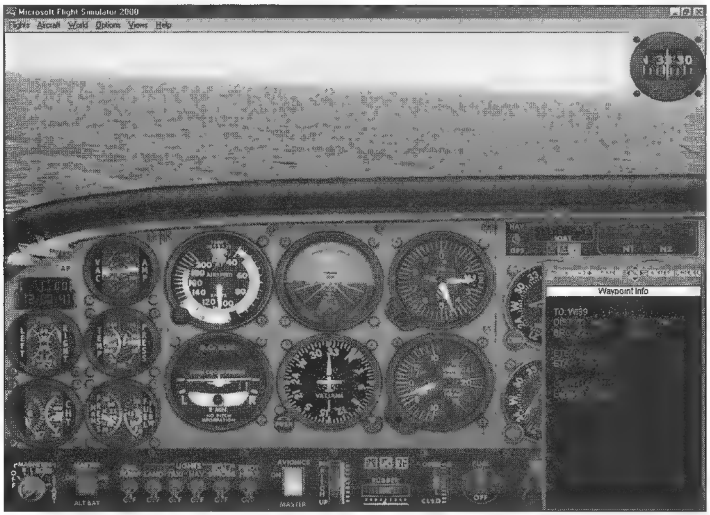


Figure 17-2
With some basic math skills, you can estimate your speed if you have a flight plan programmed into your GPS.

markers, and it's likely that you are flying level. Note the relationship between the plane in the turn coordinator and the plane in the attitude indicator (Figure 17-3).

Systems

Losing a key instrument is bad enough, but losing a whole system can really ruin your day. Here we provide emergency procedures for dealing with the loss of vacuum, pitot static, and electric systems.

Vacuum

If the vacuum pump fails, you lose your attitude and heading indicators. When multiple gauges fail, you must crosscheck their readings with other gauges, rather than believe what you're seeing as the needles slowly phase out and die. As a routine check during a long flight, you should periodically match your heading indicator against the compass. If these two readings suddenly stray, it could be your first warning of pump failure.

Figure 17-3. The relationship isn't exact, but the airplane in the Turn Coordinator banks in the same direction as the one in the Attitude Indicator.

Pitot Static

The pitot static lines provide vents to the airspeed indicator to measure changes in ram (dynamic) air pressure and static (passive) air pressure. As the difference between these readings grows, so does your airspeed. The altimeter is also vented to the static port, as is the vertical speed indicator, which depends on pressure changes to its diaphragm to measure ascent and descent. You will lose these three gauges immediately if the pitot static system fails (Figure 17-4).

Electric System

If you suddenly lose electrical power, flip the master switch off and on, just in case you inadvertently shut down the system. If the system is really gone, you are without radios and navigation, which is not good if flying under IFR. Fortunately, your main gauges are vacuum driven (airspeed, altimeter, and VSI), so you'll still know what the airplane is doing; you just won't know where

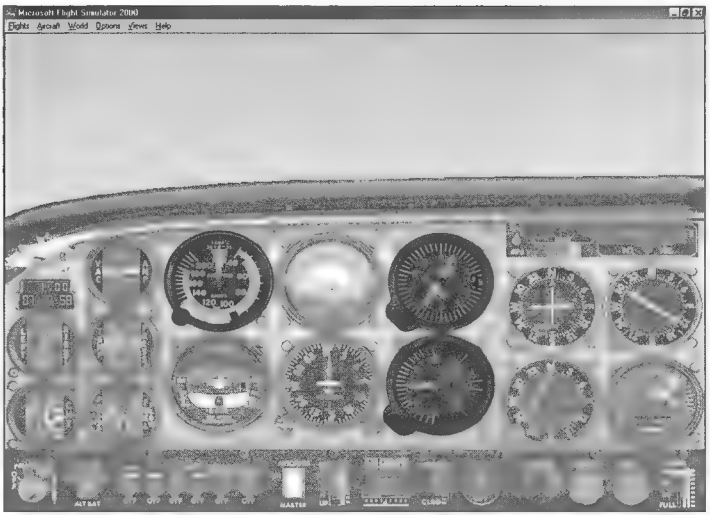


Figure 17-4
The attitude indicator shows our airplane climbing, but you couldn't prove it by the failed VSI or altimeter. The dead airspeed indicator rounds out our disabled Pitot Static system.

you're going. If you have absolutely no idea where you are, or you are flying in bad weather, descend slowly until you get a visual fix. Look for level ground and put the plane down. If visibility is poor, remember to descend slowly, just in case the ground elevation is higher than it looks.

Radios

On a clear day, you can fly forever (or at least until fuel runs out) without a radio, just as long as you can pick out visual landmarks that will lead you to an airport. However, losing communications or navigational radios at night, or during a storm, force you to fly blind, which is a scary proposition. *MFS2000* lacks true radio communications (except for prerecorded ATIS reports), so if you lose your radio or transponder, it's hardly noticeable. However, losing your NAV radios and ADF on an IFR flight spells big trouble.

MECHANICAL FAILURES

Although you can select timed emergencies in the System Failures screen, you can program key commands that trigger a long list of mechanical failures. The following tips help you deal with things that go bump and shut down in the night.

We have already covered these failures:

- Electrical Failure: See Electric System above.
- Static Port Blockage: See Pitot Static System above.
- Vacuum Failure: See Vacuum above.

Pitot Tube Blockage

When the pitot tube is blocked, the cause is usually moisture or ice. Flip the pitot heat switch to warm the air in the tube and clear the blockage. If this doesn't work, descend to warmer temperatures (especially if you are flying through clouds) until the airspeed indicator starts working again.

Hydraulic Failure

If you lose hydraulics, you may be without brakes, flaps, ailerons, elevators, or rudder. Here are possible solutions for each failure.

Brakes

Take these steps to compensate for brake probable brake failure when the hydraulic system fails during flight.

1. Descend gradually. Take your time coming down so that your angle of descent is very gentle.
2. Lose weight. Your only option is to dump fuel. Stay in the air until your tanks have just enough for landing (don't cut it too close!).

3. Land into the wind. Headwinds slow you down. Check the ATIS frequency (if near an airport) for weather conditions. If you cannot obtain information over the radio, fly north, south, east, and west at a steady speed. Note which direction causes you to slow down. This is not a precise measurement, but every little bit helps.

Flaps

If you lose flaps, a great deal depends on their position at the time of loss. If they're retracted, you lose the ability to add drag when you need it. If they freeze while extended, you have drag whether you want it or not. Fly within prescribed airspeed range for whatever flap condition you have, and look for a long runway for a hot landing if they are in the up position (and you also have no brakes?).

Ailerons

You can replace aileron function with the combined use of elevators and rudder.

Elevators

Without elevators, you must rely upon throttle application and flaps to adjust pitch and lift.

Rudder

You can forget about coordinated turns without a rudder, but you can still turn the airplane with the ailerons. In a multi-engine airplane you can also throttle back one engine to induce rudder yaw on that side.

Brake Failure (after landing)

If you lose your brakes after landing a Boeing 777, you must rely on reverse thrusters to slow down. This is not a major disaster, because the thrusters do a good job of reducing speed. Still, you may need to make a series of gentle turns to bring the big plane to a halt. *MFS2000* allows you to key in total brake failure or a single-side failure.

Engine Failure

If you lose an engine on a multi-engine airplane, your biggest challenge is to compensate for a loss of thrust on one side of the airplane. Use the rudder to correct the resulting yaw. If the failure happens on takeoff, the problem is more severe because of low speed. Try to stabilize the airplane and establish level flight before looking for a place to land.

The biggest consideration when your *only* engine shuts down is to control your turns. Do not make sharp, abrupt adjustments to your course, or you risk putting the airplane into a deadly spin. Your airplane will glide efficiently if you descend gradually and avoid sudden turns. If possible, land into the wind to effect a slow, gradual descent. Finally, look for familiar terrain. If you have enough altitude, check your GPS for the closest airfield.

TIP

Although a stall seems to happen without warning, your plane gives you a few hints. The most obvious is a gradual loss of speed and slight wing shudder. Also, the controls seem sluggish and nonresponsive. Of course, these indicators last for only a second or two, so you must respond immediately to prevent the stall. Simply lower the nose to regain speed and avert the impending stall.

STALLS

Simply put, a stall occurs when there is a complete lack of lift. This happens in a steep climb (Figure 17-5) when the angle of attack (angle at which the wing meets the air) becomes so severe that air pulls away from the top surface of the wing. Without air on top, the wing cannot produce lift, so the airplane drops like a stone (Figure 17-6).

Ironically, a stall puts the airplane in its best position for recovery. Instead of fighting to keep the climb going by pulling the nose up, let the airplane fall until it regains speed, which in turn eliminates the stall. This is not a problem if you have sufficient altitude. If close to the ground, keep your hand ready on the stick and pull up as soon as you have speed and lift.

SPINS

In a stable aircraft, it's actually quite difficult to induce a spin without slamming the plane through a very hard turn. The result is actually a stall, followed immediately by the spin. When you bank too severely, it is common for the airplane's nose to get too

Figure 17-5
The stall warning buzzer just sounded in this Cessna 182S, as airspeed instantly plummets from 80 knots to 0.

Figure 17-6
Just two seconds later, the Cessna is diving to the earth, but at the same time, it is recovering from the stall.

Figure 17-7
After a hard left, this Mooney Bravo falls out of the turn and into a stalled spin.

high, causing the plane to literally fall out of the turn (Figure 17-7), which also induces a spin. Take the following steps to correct a spin and stabilize your airplane.

1. Push the stick forward to gain speed and break the stall.
2. Move the stick in the direction of the spin, while at the same time applying rudder in the same direction.
3. When your nose drops (Figure 17-8), pull back on the stick and use the acquired speed to recover some of your lost altitude (Figure 17-9).

Like a stall, a spin can be fatal at low altitudes because you lack adequate room to maneuver back into stable flight. However, you must not fight the spin. Your only chance to recover is to nose down and turn into the spin, assisting the natural aerodynamics of the airplane to returning to level flight.

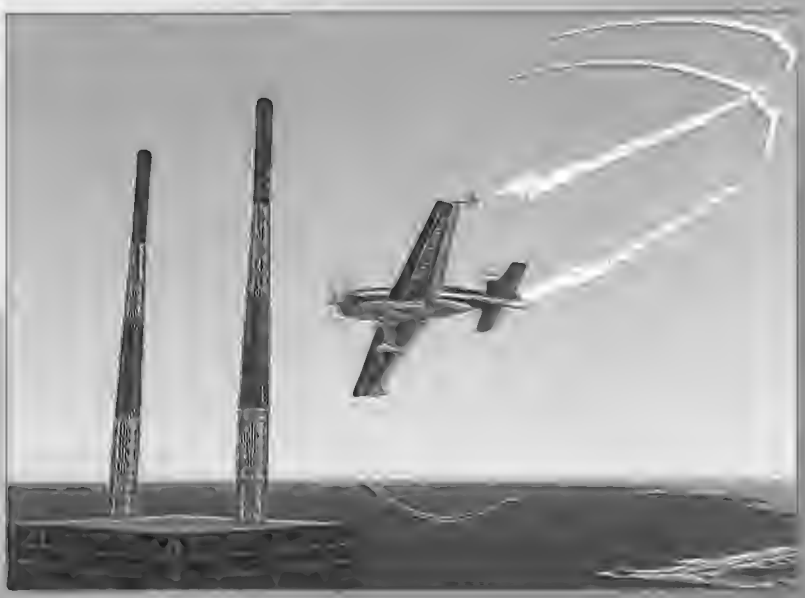
Figure 17-8
With the plane squared and nose pointed downward, recovery is moments away.

Figure 17-9
Now that the Mooney is stable, we pull back on the stick, and once level, we can begin to climb.

CHAPTER

18

Aerobatics



Now that you're comfortable with the standard procedures and practices of flight, it's time to challenge the skies in the Extra 300S exhibition airplane. This nimble and powerful bird is the mount of choice for most professional stunt pilots. Agility and thrust to spare do not automatically equate to an easy ride, however, and an inexperienced pilot can be easily overwhelmed by the aircraft's instability. Nonetheless, the romance and danger of aerobatics dance is in almost every pilot's head, and *Microsoft Flight Simulator 2000* provides the opportunity to try these challenging maneuvers without risking life and limb.

Advanced flight techniques are not all for show. Maneuvers such as the slip can be critical in lining up a landing, especially in a crosswind. Learning to fly reliably near your stall speed is extremely useful in low-speed flight, such as during takeoff and landing. Finally, learning how your plane performs at the edges of

Figure 18-1
The Extra 300S has all the power and maneuverability that you'll ever need, but it's wildly unstable. If you're a novice pilot, be gentle.

its flight envelope gives you a better sense of its capabilities and limitations. The more you understand your aircraft, the more you'll be capable of contending with an emergency situation.

The aerobatic maneuvers described here are conducted with the Extra 300S, which is purpose-built for aerobatic flying. This agile aircraft owes its maneuverability to being inherently unstable. This means that there's very little keeping it from departing controlled flight at any given time. This borderline performance allows an experienced pilot to do things that would normally be undesirable; it also lets novice pilots do things that are not only undesirable, but also potentially fatal!

If you were to try these maneuvers in your Skylane or Learjet, you might find your plane stalling from too little power, or ripping its wings off from too much stress. The Extra 300S is nimble to the extreme and has a ridiculously high thrust-to-weight ratio. You can actually "hang" the aircraft on the propeller for a short time! Just about anything that can be done in an airplane can be done with the Extra. Before you try these challenging maneuvers, just take it up for a leisurely go-round to get a feel for its performance. Pay close attention to the torque-induced roll and the heavy yaw caused by the massive engine. Also notice the strong effects of instantaneous power, such as when you suddenly apply full throttle.

G FORCES

You don't have to hang around aerobatic pilots very long before they start talking about "pulling Gs." The term G force (short for "gravity force") is a measure of acceleration. Strange as it may sound, the force of gravity is actually a constant acceleration in the direction of the ground—no different from the sideways acceleration you feel when rolling out for takeoff. Most people think of their weight as a set number, as in "I weigh 150 pounds." However, weight is truly your *mass* multiplied by your *acceleration* (Force = Mass x Acceleration).

Figure 18-2
Pulling some serious Gs in order to navigate a Manhattan street corner. Note the smoke trails—this Extra has just turned as tightly as an automobile!

When you're just hanging out experiencing the constant 9.8 m/s<+>2<+> acceleration of gravity, your weight is normal: one times your "regular" weight. This is 1 G. If you were to experience double the acceleration in the direction of the ground, suddenly you would weigh twice as much; a 150-pound person would feel as if he weighed 300 pounds! This condition is called 2 Gs, meaning twice the normal force of gravity.

When flying, your plane's motion is a *vector*—a combination of a speed and a direction. When you turn the aircraft, you change that vector, which requires you to exert acceleration in the direction of your turn. There's a lot of extra mumbo-jumbo that goes into the physics of the whole thing, but the important part is the acceleration. Because gravity is just another acceleration to Mother Nature, the turning acceleration feels just like gravity!

If you execute a nice, gentle turn, you won't really feel the effects of the additional G forces; they'll be very small. The harder

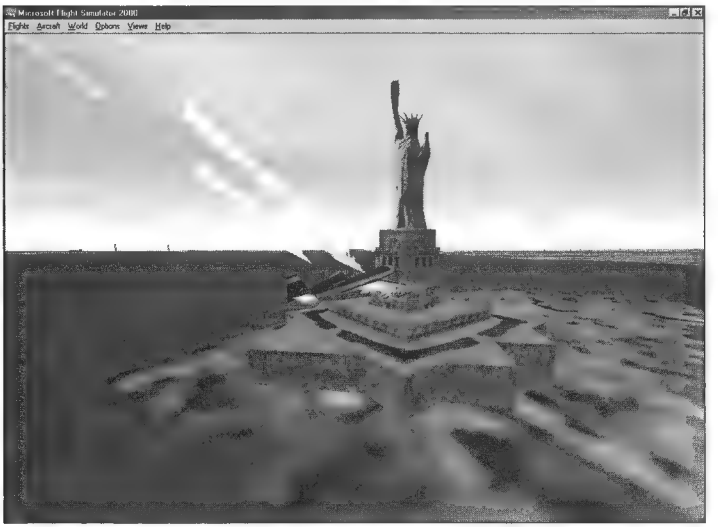


Figure 18-3
Despite all its power and agility, it's deceptively easy to fall out of the sky in the Extra.

you turn, the more Gs you induce. Generally, aircraft must pull up along their *lift vector* to turn hard, which means banking sharply and pulling back on the stick. As you increase your turn rate, you'll be pushed farther and farther back into your seat due to the extra G forces acting on your body. Conversely, if you "unload" your aircraft by pushing the nose over toward the ground, you can actually cancel out the force of gravity and experience microgravity (0 Gs), or even negative Gs (which are very uncomfortable).

Every type of aircraft has a different structural tolerance for G forces. Light civilian aircraft such as the Skylane aren't really built to handle very many Gs, while purpose-built aerobatic planes such as the Extra are born and bred on high Gs. Never push your aircraft beyond its designed performance envelope, or you risk nasty consequences up to and including digging a deep hole in the ground.

NOTE

Because slips require you to use opposite rudder as you bank the aircraft, turn off Auto-Coordination in the Options menu to use this maneuver.

THE SLIP

The slip is the most commonly used of all maneuvers described in this chapter. Basically, a slip allows a plane to move sideways through the air while maintaining the same facing. The practical applications for a slip are obvious, as you have certainly found yourself on final approach to a runway only to wish you were *slightly* to the left or right. A full-on banking turn might take too long or be too radical for your airspeed and altitude, but a slip could be just the thing to put you on the money for a perfect landing.

Slips can also help you overcome crosswinds by making the aircraft "crab" through the air, which is basically an extended slip. When executing this maneuver to line up a landing in a crosswind, it's called a "wing-low" approach. Just make sure to bring your wings back to level and step on the ball on your turn coordinator just before touchdown, or you may find yourself damaging your landing gear strut on the low side.

To execute a slip, drop one wing into a gentle bank. The proper attitude for a gentle slip is roughly a 10-degree bank angle. Next, apply opposite rudder to prevent the nose from falling

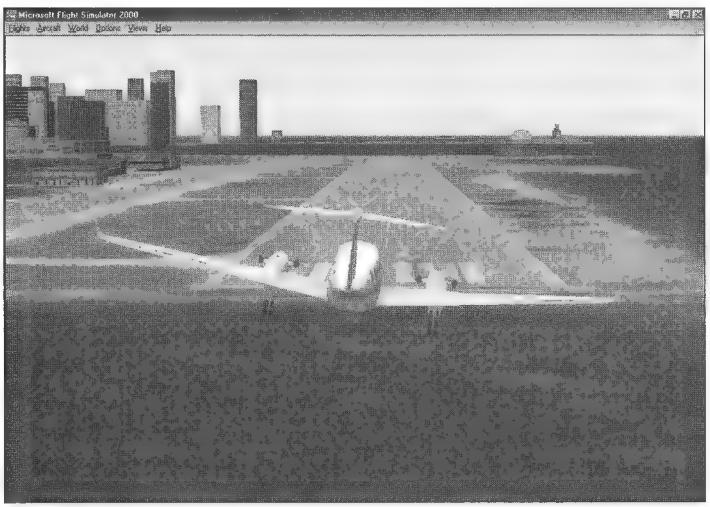


Figure 18-4
This King Air is slipping right to compensate for a crosswind blowing over the runway to the left.

through the bank. Your plane will slide in the direction of your dropped wing, but by managing rudder input you can maintain the same heading. Watch the compass or the VOR, and add more or less rudder as needed to maintain the same heading.

TIP

For a dramatic look at any of your maneuvers, hit [1] or select Smoke from the Aircraft menu. This causes a thin line of smoke to trail from each wingtip, recording your stunt-flying glory in a white trail across the sky. If you're having a really good day, you can even record your stunts with the flight video recorder.

THE CHANDELLE

The Chandelle is one of the oldest aerobatic maneuvers in the history of flight. This graceful, looping turn is not only beautiful to watch, but is also immensely practical as a method of turning quickly within the smallest radius possible. Traditionally, the Chandelle was used to gain the trailing position on an enemy fighter. However, you may employ this elegant maneuver in your civilian career to get you out of trouble in a hurry, or to swiftly go back around in the direction from which you came.

A Chandelle is a coordinated, climbing rudder turn. To pull one off, peg your throttle to full and start with a steady 20 to 30-degree bank. Next, apply a gentle rudder push in the direction of the turn as you pull back on the yoke. Maintain gentle rudder input and steady back pressure on the yoke as you pass halfway through your turn. You should be at around a 90-degree bank angle by this time resulting from the natural wing drop through the turn rather than aileron roll. You are using your rudder to manage this turn, not your elevators, so don't stall your aircraft by pulling back to hard.

Because of the bank angle, your rudder will actually induce roll on your plane. Use your rudder to push your plane over onto its back, and continue to gently pull back on the yoke. As you complete roughly three-quarters of your turn, you should be in about a 120-degree bank (thus, inverted), and your nose should be almost level with the horizon.

All that's left to complete the maneuver is to level your wings and head back the way you came. Let the elevators return to neutral position and simply roll your aircraft back in the opposite direction it rolled through the turn to level, upright flight. You'll complete the last quarter of the turn in your bank recovery, having doubled back onto the reciprocal of your original heading.

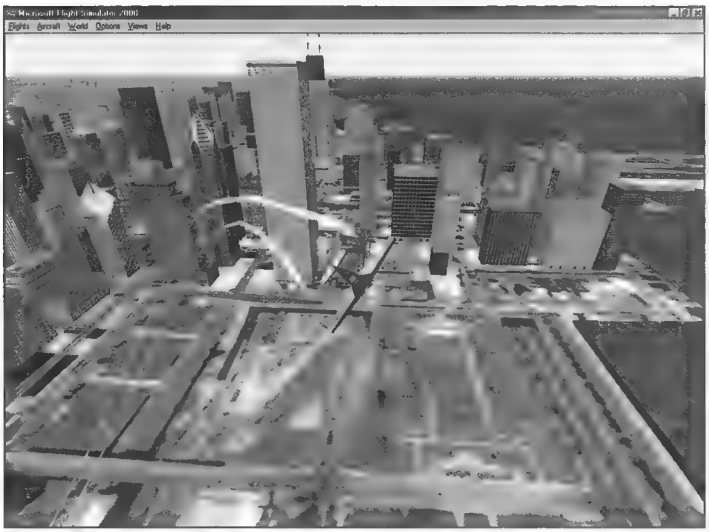


Figure 18-5
Rolling back to level flight at the top of the Chandelle. Note that this plane hasn't come around to the exact opposite of its original heading; you can choose to come out early, or swing further around by coming out late.

NOTE

Rolls combined with elevator input are called loaded rolls, because the pitch-up puts extra G loading on the aircraft. Your roll rate is slower in a loaded roll than in an unloaded roll, so if you ever need to snap your wings around, don't add any elevator input.

The Chandelle is perhaps the most gentle of all the aerobatic maneuvers described in this chapter. Because of the relatively low stresses this maneuver imposes on the airframe, you can safely perform a Chandelle with any of the aircraft available in *MFS2000*.

THE BARREL ROLL

Barrel rolls are simply combined aileron and elevator rolls. Normally, a basic roll is achieved by simply spinning around the plane's long axis with the use of ailerons. By combining back pressure on the yoke with such a roll, you execute a roll that corkscrews the plane through the air. From head-on, it looks like the top of the plane is stuck to the outside of a rolling barrel.

To execute a barrel roll, first drop your wing *opposite* the direction in which you are going, to go through the roll at about 30-degrees. As soon as you dip your wing, pull up and begin a steady roll in the opposite direction. The nose will rise up along your lift vector, and as you continue aileron input, you'll be constantly

Figure 18-6
The Extra can snap through a barrel roll in the blink of an eye. The smaller your control inputs, the larger the roll will be.

diverting your lift vector around the barrel. Maintain steady, equal pressure on your elevators and ailerons to coordinate the roll, or you could find your nose heading straight into the ground. As you return to level flight, settle back onto your original heading.

THE SPLIT-S

A standard banking turn brings your nose around through a horizontal plane, level with the ground. A Split-S is a turn in the vertical instead of the horizontal. After executing this maneuver, you will be lower and faster than you were originally, and you'll be heading in the opposite direction. Vertical maneuvers like the Split-S can be very useful when you don't have room to make a horizontal turn, or when you want to maintain your position relative to a ground object. In airshows, it's important to keep your plane in the same vertical plane, parallel to the runway, as much as possible. This affords the audience the most exhilarating view of your stunts!

The Split-S is a fairly straightforward maneuver. Start at a moderate-to-low airspeed, with plenty of altitude AGL. Begin the maneuver by flipping your plane over on its back, keeping the wings level with the inverted horizon. Next, apply gentle and steady back pressure on the yoke to pull the nose toward the ground.

Resist the urge to increase back pressure on the yoke as the plane nears the ground. This is a high-energy maneuver, so the high G loads at the bottom end will only stress the wings and airframe, possibly beyond their tolerance. Instead, maintain steady wing loading throughout the entire maneuver.

Continue pulling back until you complete the maneuver and exit the bottom of the turn. You are completely out of trim thanks to your newfound speed, so you must put some nose-down pressure on the yoke to stay level. If the excess speed is too much to handle, execute some gentle S-turns back and forth across your flight path to bleed it off.

Figure 18-7
A landing stunt: after overflying the runway, we put this Extra into a Split-S and came in for a touch-and-go.

THE IMMELMAN

The Immelman is a demanding, high-thrust maneuver that changes your heading over an extremely short distance. The maneuver ends at a higher altitude than it begins, so it is essentially the opposite of a Split-S, using a climbing vertical turn instead of a diving one. The Immelman is not possible in aircraft without a very high thrust-to-weight ratio; a large portion of the maneuver requires clawing straight up into the air. There's no shortage of thrust in your Extra, however; you can even perform consecutive Immelmans in this ride!

To execute an Immelman, start with plenty of speed and peg your throttle. If you ever try this maneuver in a standard passenger aircraft, run your mixture full lean to get every last ounce of power. Begin the maneuver with a gentle descent to peak your speed, then pull up smoothly into a vertical climb. Do not yank back on the stick, as high G loads will only bleed your precious speed; make your transition into the vertical swiftly, but smoothly.

Figure 18-8
With power to spare, the Extra can showboat a little during the pirouette, performing several complete rotations before having to think about pulling out.

Once in the vertical, let off the pitch. Execute a pirouette by employing an unloaded vertical aileron roll to spin your plane on its tail. Continue the roll until the top of your *head* is pointing in the direction you wish to go after you complete the Immelman. Pull back smoothly again, bringing your plane out of the climb and onto its back. Complete the maneuver by rolling upright and applying opposite rudder, if necessary, to maintain your altitude and heading.

THE CUBAN EIGHT

This maneuver is an attractive combination of two tight Immelman turns performed in series, in the horizontal. The resulting smoke trail looks like an 8 lying on its side. It's important to manage airspeed in this maneuver, because the intermediate dive can leave you too fast for the second Immelman. As strange as that sounds—being too fast—for an Immelman, it is a real concern here because the vertical turn should be as tight as possible. If you have too much energy, wing loading will be too high to safely execute the desirable tight loops. The second major concern in this maneuver is wing leveling. You must get your wings exactly even with the horizon before you pull into either loop, or you'll ruin your line in the maneuver.

To begin a Cuban Eight in the Extra, start low at a moderate speed, with smoke on. If daring enough to try this stunt in a passenger aircraft, you need more speed (we're going to assume you're not that crazy and refer to the Extra only). If performing the stunt at an airshow, approach show center parallel to the runway to give the audience the best view of your Eight. Approximately 100 meters past show center, pull back hard into a 5–6 G loop. Continue up over the top, and ease up on the yoke once your nose slips past the horizon, inverted. Ease the nose down (up, relative to your view) to a 20-degree descent, then cancel your pitch. Whip your wings through as tight a roll as you can muster to maintain the same line.

You are now in a dive, headed back across show center. Look for your original horizontal smoke trail, which will be at your

Figure 18-9
Completing the second loop of our Cuban Eight over Hill Air Force Base, Utah.

opening altitude. When you are about to reach it, pull back into your second loop with identical wing loading to the first one. Perform the exact same kind of loop, again letting your nose drop below the horizon before doing a snap roll to level out. This time, find your original smoke trail and level out instead of looping upward. You'll exit the stunt area having performed a classic airshow maneuver!

THE HAMMERHEAD

This airshow favorite is impossible in most aircraft. The Hammerhead is a vertical rudder turn made in a deep stall condition. The Extra's control surfaces are so large that they can affect the plane's attitude even when there is almost no airflow over them. You'll need rock-solid confidence in your slow-speed piloting ability to pull off this maneuver, but the Extra has everything you need to get the job done.

Start this maneuver low and at moderate airspeed. If performing at an airshow, fly a parallel approach to the runway. Approximately 50 meters short of show center, pull up into a vertical climb and cut your throttle. Watch your airspeed plummet, and when it gets down to about 30 knots, mash your throttle forward and stomp on the rudder. Kick the tail out in the *opposite* direction of the grandstands, because you always want to minimize any danger to the crowd. If you lose control in this or any other maneuver, it is important to have the aircraft's nose pointing away from the spectators. That way, even if you are completely out of control, the plane will tend to travel away from the airshow crowds.

TIP

To spice up this stunt, try adding a few pirouettes in the climb before you kick in the rudder!

Your rudder turn should bring you all the way through 180 degrees until your nose is pointing directly at the ground and you start to get nervous over the amount of detail you're seeing in the approaching runway surface. Keep the throttle pegged, and let your altitude slip just a little more to gain airspeed. Once you are near (but probably still below) stall speed, pull back on the yoke and level out. With practice, you should be able to exit the stunt at

Figure 18-10
Halfway through the harrowing Hammerhead rudder turn.

the same altitude you entered. Experiment with your entry speed to get this right.

THE CRAZY IVAN

This is the stunt to top all stunts in the airshow circuit, and it's easy to see why. The Crazy Ivan essentially amounts to letting your Extra literally tumble out of the sky, *starting* at a mere 500 feet! After completely losing control, your plane will start to fly sideways, and then backward. Completely uncontrolled movement around all three axes will leave you dizzy and dazed, but if you pull off the stunt you'll recover to the wild adoration of your airshow audience.

To perform your Crazy Ivan, start at an altitude of about 1,000 feet. You'll get down to 500 feet after a little practice. The idea is to lose no more than 250 feet of altitude while still allowing your plane to tumble completely about all three axes. At an indicated airspeed of about 120 knots, drop the throttle to about 50 percent.

Figure 18-11
Yes, that plane really is flying backwards! In the middle of a Crazy Ivan over the National Mall.

Pull up hard, throw the yoke right, and shove the tail left. Your plane will effortlessly slip out of controlled flight and into a chaotic tumble. Keep it up through two full revolutions, and then simply let go of the controls. Mash the throttle forward, and point your nose in about a 20-degree dive. Roll around to your original heading, and then grab sky. You'll have to grab this on video, because your smoke trail will not convey your plane being backwards in the air. Once you can reliably recover within 250 feet of your original altitude, drop your stunt entry to 500 feet AGL.

CHAPTER

19

Multiplayer Flights

Microsoft Flight Simulator 2000 offers you the chance to share the air with up to seven other pilots in real-time flight. You can even customize your aircraft using the aircraft editor to display your own paint schemes. The experience of flying with other pilots takes *MFS2000* to a higher level, because the aircraft under the control of the other players will truly interact with your own, resulting in an extremely realistic flying environment. You can even check out *www.microsoft.com/games/fs2000/gettingmore.htm* for some great information on virtual airlines, where groups of players have teamed up to create *MFS2000*-simulated commercial carriers, complete with certifications and regular routes!

SETTING UP

Setting up a multiplayer game requires you to have a modem, internet connection, or a local area network (LAN). Choose a method of connection by opening the Flights menu and selecting

Figure 19-1
"Get up here!" Buzzing a fellow player who hasn't left Meigs Field yet.

the Multiplayer option. You can also play on the Microsoft Internet Game Zone for free at *www.zone.com*, which simplifies many of the more complex aspects of connection. When playing on the Zone, make sure you have a fast connection to the other players in the game, especially the host. The colored meter next to each name represents connection speed: green is fast (good), and red is slow (bad).

There are programs available for download from the Internet that allow you to use your computer's speakers and microphone for real-time voice communication with the other pilots while flying! Roger Wilco is an example of this kind of program, and it's available for download at *www.rogerwilco.com* free of charge. Using this program in the background of *MFS2000* is a great aid in multiplayer flight, relieving you of the necessity of typing to communicate. That way, you can concentrate on the fun of flying!

TIP

Turn detail settings down a few notches for multiplayer use. Even though you may run smooth as silk by yourself with settings cranked up, multiplayer demands much more processing power. Reducing graphics quality helps keep your frame rates up where you like them.

MULTIPLAYER CHALLENGES

Without any additional utilities or add-on programs, you can create several multiplayer challenges using *Microsoft Flight Simulator 2000*. You can race your friends in a flat-out speed challenge, or chase each other down narrow city streets and under low bridges in a test of handling skills. There are also challenges that measure your flying finesse and technique. Here are several ideas for creating and executing these multiplayer challenges using nothing more than the features shipped with *MFS2000*.

Follow the Leader

The most basic of the multiplayer challenges is by no means the easiest. To set up a Follow the Leader challenge, all pilots should select the same aircraft. Next, line up on the same runway, and when the leader gives the "go, " take off in single-file order. It's important to maintain spacing in the trail, because if everyone tries to follow directly behind the pilot, you'll eventually collide with one another.

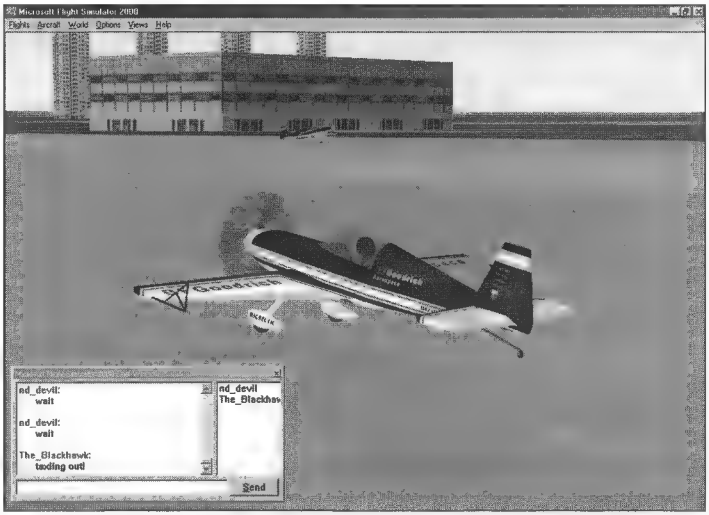


Figure 19-2
Lining up for a Follow the Leader takeoff.

Upon takeoff, the leader should execute a steady, gentle climb to 1,000 feet. Once altitude has been achieved, the leader should give a second "go" code, signifying the start of the challenge. The idea is for the followers to chase the leader no matter where he goes. Maintain at least 100 meters of space from the plane you follow so you can see what's going on. You may even find it useful to use the Spot Plane view so you can take advantage of the wide-angle zoom mode to see a larger proportion of the world around you.

TIP

Try out one of the highly detailed cities, like Boston, D.C., or Rome, for these challenges. The added terrain detail is great for finding particularly challenging flight paths.

The leader should execute challenging maneuvers in and around areas with obstacles. However, the leader must avoid conducting any severe maneuvers, because it'll be too hard for the followers to tell what the leader has done until it's too late to follow. If you're leading the flight, take the other pilots between buildings and under bridges; make your approaches smoothly and gradually. It's much more exhilarating to lose your chase planes courtesy of the side of a mountain than to have them break off because they couldn't figure out where you went! Also, try using about 95 percent throttle at the most so that any stragglers can always catch up.

Each pilot should have roughly five to ten minutes to play the

Figure 19-3
Following nd_devil through the London suburbs. See how we anticipate the leader's moves (somewhat) by watching his nose?

leader, and then a new leader should be selected. The easiest way to do this is by alphabetical order of the pilot names, but you can also try to decide which trailer did the best job of following the leader. The new leader should be free to choose another aircraft for all the pilots to fly, or to choose a different flight area. If you keep changing the area in which you fly, you'll find you can keep the challenge fresh and exciting for several hours.

Formation Flying

A challenging variation on Follow the Leader—Formation Flying—demands precision and teamwork. You and your wingmen must attempt to maintain standard airshow and military aviation formations throughout a variety of maneuvers. Success demands exceptional individual skill and incredible coordination between pilots. One pilot should act as the formation leader while the others perform as wingmen. For the sake of coordination and clarity, the formation leader makes all "go" calls, signaling the rest of the formation when to start the next maneuver.

The lead pilot must be gentler than ever on his controls. Any sudden maneuvers can throw off the entire formation, and it is very difficult to reassemble the planes once they have scattered. As in Follow the Leader, the lead pilot should apply no more than 95 percent power to allow a buffer zone for the wingmen in case they fall behind. Start practicing with simple, straight-and-level flight in formation. The echelon formation works best, with each wingman behind and to the left or right of the plane in front. Try a separation of about 50 feet at first, and then tighten up the formations as your skills improve.

You should get a regular group of pilots together to attempt Formation Flying because of the level of coordination that is necessary. Start with a single maneuver, then work on others as you gain proficiency. It's important to get at least one maneuver down well, so that you can always go back to something you do well after a few disappointing tries at something new. Pulling off a maneuver in perfect formation, with smoke trailing behind you, is a wonderful sensation. The loop is an excellent choice for a first formation maneuver, because it only requires coordinated elevator

Figure 19-4
Formation practice in the Extra 300S. The flight leader should never use smoke, to avoid blinding the rest of the flight!

input. Maneuvers like formation barrel rolls or even formation turns are much more complex, because each plane in the formation has to do slightly different control inputs to maintain formation. Furthermore, these advanced maneuvers require manipulation of all control surfaces; this exponentially increases their complexity.

Drag Racing

A Drag Race is any point-to-point speed challenge. The usual way of performing this challenge is to start all the planes at a large airport with two parallel runways. All pilots start at the base end of one of the runways, and on the "go" signal, they may release their parking brakes. Once the race is on, each pilot attempts to be the first one to land at a specified destination. Whoever first comes to a complete stop on the runway is deemed the winner of the race.

To succeed at Drag Racing, you must have a strong understanding of the performance characteristics of your plane. If you're going any significant distance, establish your optimum rate of

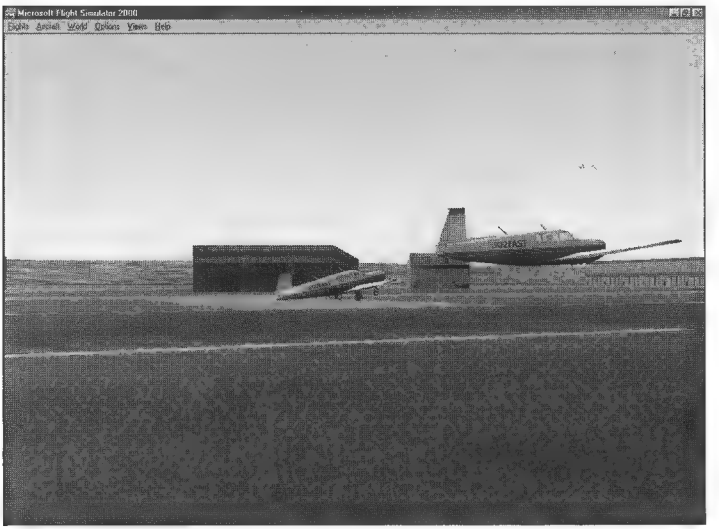


Figure 19-5
The Drag Race is on!

climb in order to achieve your best cruising altitude. Down on the deck, planes have more air (higher density)to push through; this slows them down. If too high, the thin air prevents planes from getting as much efficiency from their propeller. Knowing the sweet spots of your plane's performance can shave minutes off your flight times. Check out your game manual for performance data on every aircraft in the game.

Obstacle Course

Like the Drag Race, the Obstacle Course is a speed challenge, but instead of going from one place to another, the object is to start at a specific checkpoint, fly a specified path, and then return to the point of origin. Each pilot takes a turn running the obstacle course while the other pilots watch the show both for entertainment and to ensure completion of the whole course. Another variation is to run all pilots through the course at the same time, but if you have a tight course it can get very crowded very quickly. The winner is

Figure 19-6
Taking a turn on the obstacle course through San Francisco.

the fastest pilot through the entire course without missing any of the specified turns.

The course should be clearly explained at the beginning of the race. Under the Golden Gate, around the back of the Transamerica Tower, and then under the Oakland Bay Bridge on the far side of Treasure Island is a good obstacle course in the San Francisco Bay area. If you don't want to start the race on the ground, have a player hover at the start point (above Alcatraz, for example) in a JetRanger, and start the timer when the running pilot zooms past on his way under the Golden Gate Bridge. At the end of the race, the pilot has to make it back to the chopper to stop the timer. If you're all flying together, whoever passes the start landmark first, wins.

Circuit Race

Another type of race is the racetrack circuit pattern. It is similar to the obstacle course, but the focus is on sustained speed instead of

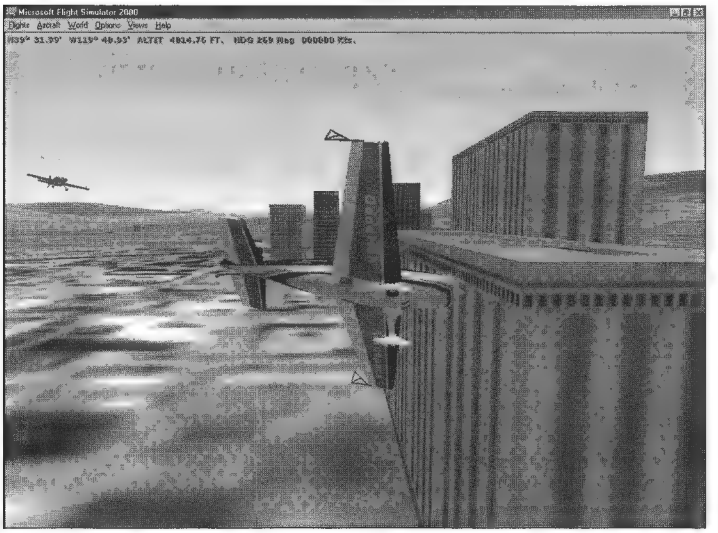


Figure 19-7
Leading the pack around the Circus Circus turn in Reno.

navigating hazards. A racetrack is formed by the outside extreme of any convenient cluster of buildings. Select one of the moderately detailed cities and fly under 300 feet. The buildings of downtown Reno, Nevada make an excellent racetrack circuit, and the location is appropriate because the annual National Championship Air Races are held just north of Reno every year at Stead Airport. Use the outermost buildings as the inside boundary of your racecourse.

Have all the planes complete a pace lap together around the course at approximately 75 percent throttle and in close formation. When you pass a building specified as the start line, throttle up and go three laps. The challenge of maintaining the maximum possible speed while cornering your aircraft is a worthy one. Many pilots do not realize just how much energy they waste when they take a turn; here's your chance to find out how efficient you are. With practice, you'll learn to make perfectly coordinated turns to conserve as much speed as you can.

PART

IV

Appendixes

APPENDIX

A

List of Keyboard Commands

KEYBOARD SHORTCUTS

This table gives you a quick look at all the keyboard commands in *Microsoft Flight Simulator 98*. The column "Repeat Option?" simply lets you know whether you can set a key to repeat automatically when pressed and held (Y = yes, N =no). The "+" simply means "in addition to." For example, "CTRL + C" means you need to press the "Control" key along with the "C" key at the same time. An asterisk (*) under "Keystrokes" means that the key has not been assigned, but it *can* be assigned. You can assign keys in the "Customize Controls" dialogue in the Options menu. Num Lock means Num Lock "OFF," use Num Pad.

Command	Keystrokes	Repeat Option?
Exit *Flight Simulator*	Ctrl + C	N
Exit *Flight Simulator* (immediately)	Ctrl + Break	N
Pause	P	N
Joystick on/off	K	N
Toggle sound	Q	N
Slew mode only (insert the following keys after Slew Mode):		
Toggle slew mode on/off	Y	N
Set heading north/ attitude straight and level	Spacebar	
Move forward	Num Lock 8	
Move backward	Num Lock 2	
Move left	Num Lock 4	
Move right	Num Lock 6	
Freeze horizontal movement	Num Lock 5	
Move up slowly	Q	
Move up quickly	F4	

Command	Keystrokes	Repeat Option?
Move down slowly	A	
Move down quickly	F1	
Freeze vertical movement	F2	
Rotate left	Num Lock 1	
Rotate right	Num Lock 3	
Freeze rotation	Num Lock 5	
Move nose up	F3 or 9	
Move nose up quickly	F5	
Move nose down	F7	
Move nose down quickly	F8	
Freeze pitch	F6	
Bank left	Num Lock 7	
Bank right	Num Lock 9	
Freese banking	Num Lock 5	
Pan view up	Shift + Backspace	
Pan view down	Shift + Enter	
Pan view left	Ctrl + Shift + Backspace	
Pan view right	Ctrl + Shift + Enter	
Toggle mouse-as-yoke mode	Ctrl + Num Lock Del	N
Select time compression	R	N
Save flight	;	N
Reset current flight	Ctrl + ;	N
Decrease selection/zoom out	-	Y
Increase selection/zoom in	=	Y
Decrease selection slightly	Shift + -	N

Command	Keystrokes	Repeat Option?
Increase selection slightly	Shift + =	N
Select Item 1	1	N
Select Item 2	2	N
Select Item 3	3	N
Select Item 4	4	N
Left ailerons (bank left)	Num Lock 4	N
Right ailerons (bank right)	Num Lock 6	N
Left rudder (yaw left)	Num Lock 0	N
Right rudder (yaw right)	Num Lock Enter	N
Center ailerons and rudder	Num Lock 5	N
Up elevator (pitch up)	Num Lock 8	N
Down elevator (pitch down)	Num Lock 2	N
Decrease throttle	Num Lock 3 or F2	N
Increase throttle	Num Lock 9 or F3	N
Trim up (elevator)	Num Lock 1	Y
Trim down (elevator)	Num Lock 7	Y
Cut throttle	F1	N
Full throttle	F4	N
Fully retract flaps	F5	N
Raise flaps (increments)	F6	Y
Lower flaps (increments)	F7	Y
Fully extend flaps	F8	N
Display/Hide Kneeboard	F10	N
Set prop RPM to high	Ctrl + F4	N
Increase prop RPM	Ctrl + F3	N
Decrease prop RPM	Ctrl + F2	N
Set prop RPM to low	Ctrl + F1	N

Command	Keystrokes	Repeat Option?
Fully rich mixture	Ctrl + Shift + F4	N
Concorde only:		
Fully lower nose/visor	F8	N
Lower nose/visor (increments)	F7	Y
Raise nose/visor (increments)	F6	Y
Fully raise nose	F5	N
Enrich mixture slightly	Ctrl + Shift + F3	N
Lean mixture	Ctrl + Shift + F2	N
Set mixture to idle cutoff	Ctrl + Shift + F1	N
Toggle landing gear	G	N
Manually pump landing gear	Ctrl + G	N
Brakes (apply/release)	. (period)	Y
Brakes (left)	F11	N
Brakes (right)	F12	N
Set parking brake	Ctrl + . (period)	N
Toggle spoilers/air brakes	/	N
Arm autospoilers	Shift + /	N
Toggle carb heat/ de-ice on/off	H	N
Toggle pitot heat on/off	Shift + H	N
Select an engine	E	N
Select jet starter	J	N
Select magnetos	M	N
Toggle smoke system	[	N
Toggle all lights	L	N
Toggle strobe lights	O	N
Panel lights on/off	Shift + L	N

Command	Keystrokes	Repeat Option?
Landing lights on/off	Ctrl + L	N
Look ahead/up	Ctrl + Num Lock 8	N
Look back/up	Ctrl + Num Lock 2	N
Look ahead/right/up	Ctrl + Num Lock 9	N
Look back/right/up	Ctrl + Num Lock 3	N
Look back/left/up	Ctrl + Num Lock 1	N
Look ahead/left/up	Ctrl + Num Lock 7	N
Look down	Ctrl + Num Lock 5	N
Aileron trim left	Ctrl + Num Lock 4	N
Aileron trim right	Ctrl + Num Lock 6	N
Engine auto start	Ctrl + E	N
Mask battery/alternator switches on/off	Shift + M	N
Reset directional gyro	D	N
Reset altimeter	B	N
Autopilot master switch on/off	Z	N
Autopilot attitude hold on/off	Ctrl + T	N
Autopilot localizer hold on/off	Ctrl + O	N
Autopilot approach mode on/off	Ctrl + A	N
Autopilot heading hold on/off	Ctrl + H	N
Autopilot altitude hold on/off	Ctrl + Z	N
Autopilot wing leveler on/off	Ctrl + V	N
Autopilot back course mode on/off	Ctrl + B	N
Autopilot NAV1 hold on/off	Ctrl + N	N
Toggle yaw damper on/off	Ctrl + D	N
Toggle airspeed hold on/off	Ctrl + R	N
Arm auto-throttle	Shift + R	N

Command	Keystrokes	Repeat Option?
Auto-throttle takeoff/ go-around (TOGA)	Ctrl + Shift + R	N
Toggle mach hold on/off	Ctrl + M	N
Select transponder	T	N
Select COM radio	C	N
Select NAV radio	N	N
Select an OBS indicator	V	N
Select a DME	F	N
Select ADF	A	N
Identify VOR1 on/off	Ctrl + 1	N
Identify VOR2 on/off	Ctrl + 2	N
Identify DME1 on/off	Ctrl + 3	N
Identify DME2 on/off	Ctrl + 4	N
Identify ADF on/off	Ctrl + 5	N
Select EGT	U	N
Close view window	]	N
Create new view window	[	N
Create new top down view window	Shift +]	N
Switch to next view	Ctrl + Tab	N
Switch to previous view	Ctrl + Shift + Tab	N
Cycle view modes	S	N
Cycle view modes backward	Shift + S	N
Switch to top down view	Ctrl + S	N
Cycle view types backward	Ctrl + Shift + S	N
Maximize view	W	N
Bring window to front	'	N
Toggle instrument panels on/off	Shift + [	N

Command	Keystrokes	Repeat Option?
Cycle coordinates/frame rate	Shift + Z	N
Set zoom to 1X	Backspace	N
Select view direction	Num Lock /	N
Pan view left	Ctrl + Shift + Backspace	Y
Pan view right	Ctrl + Shift + Enter	Y
Pan view up	Shift + Backspace	Y
Pan view down	Shift + Enter	Y
Pan view reset	Ctrl + Spacebar	Y
Look ahead	Shift + Num Lock 8	N
Look ahead/right	Shift + Num Lock 9	N
Look right	Shift + Num Lock 6	N
Look back/right	Shift + Num Lock 3	N
Look back	Shift + Num Lock 2	N
Look back/left	Shift + Num Lock 1	N
Look left	Shift + Num Lock 4	N
Look ahead/left	Shift + Num Lock 7	N
Look up	Shift + Num Lock 5	N
Stop video (replay or recording)	Esc	N
Add text to video	, (comma)	N
Stop analysis	\	N
End lesson/adventure	Esc or Ctrl + U	N
Full screen mode	Alt + Enter	N
Display menus in full screen mode	Alt	N
Toggle panel window 1 on/off	Shift + 1	N
Toggle panel window 2 on/off	Shift + 2	N
Toggle panel window 3 on/off	Shift + 3	N

Command	Keystrokes	Repeat Option?
Toggle panel window 4 on/off	Shift + 4	N
Toggle panel window 5 on/off	Shift + 5	N
Toggle panel window 6 on/off	Shift + 6	N
Toggle panel window 7 on/off	Shift + 7	N
Toggle panel window 8 on/off	Shift + 8	N
Toggle panel window 9 on/off	Shift + 9	N
Cycle through other players	Ctrl + Shift + T	N
Toggle track mode	Ctrl + Shift + D	N
Follow other player	Ctrl + Shift + F	N
Switch to observer mode	Ctrl + Shift + O	N
Toggle chat window on/off	Ctrl + Enter	N
Switch focus to chat window	Enter	N
Send ATC text message	Num Lock + +	N
Closed captioning ON (lessons/adv)	Ctrl + Y	N
Closed captioning OFF (lessons/adv)	Ctrl + W	N
Aileron trim left	Ctrl + Num Lock + 4	Y
Aileron trim fight	Ctrl + Num Lock + 6	Y
Reheat/afterburner on/off	Shift + F4	N

APPENDIX

B

Airports, VORs, and NDBs

AFRICA

Airports

Gran Canaria, Canary Islands – Gran Canaria

Ident	LPA	**ATIS**	118.60
Elev	77	**Rwy/Length/ILS/ID**	03L/10171/109.90/ILP
Lat	N27°55'		21R/10171
Long	W15°23'		03R/10171
			21L/10171

Al Ismailiyah, Egypt – Al Ismailiyah AB

Ident	—	**ATIS**	—
Elev	39	**Rwy/Length/ILS/ID**	—
Lat	N30°42'		
Long	E32°14'		

Cairo, Egypt – Cairo Intl

Ident	CAI	**ATIS**	122.60
Elev	382	**Rwy/Length/ILS/ID**	05L/10827/110.90/CRL
Lat	N30°07'		23R/10827/110.30/CRR
Long	E31°24'		05R/13123/109.90/ROT
			23L/13123/109.50/LOT
			16/10279
			34/10279

Cairo, Egypt – Giza (Embada)

Ident	—	**ATIS**	—
Elev	58	**Rwy/Length/ILS/ID**	—
Lat	N30°04'		
Long	E31°11'		

Port Said, Egypt – Port Said

Ident	—	**ATIS**	—
Elev	11	**Rwy/Length**	—
Lat	N31°16'		
Long	E32°14'		

Abidjan, Ivory Coast – Port Bouet

Ident	ABJ	**ATIS**	118.10
Elev	20	**Rwy/Length/ILS/ID**	03/8858
Lat	N05°15'		21/8858/110.30/AN
Long	E03°55'		

Nairobi, Kenya – Jomo Kenyatta Intl

Ident	NBO	**ATIS**	118.70
Elev	5327	**Rwy/Length/ILS/ID**	06/13507/110.30/NL
Lat	S01°19'		24/13507
Long	E36°55'		

Antananarivo, Madagascar – Ivato

Ident	TNR	**ATIS**	118.10
Elev	4196	**Rwy/Length/ILS/ID**	11/10171/109.50/IO
Lat	S18°47'		29/10171
Long	E47°28'		

Casablanca, Morocco – Mohamed V

Ident	CMN	**ATIS**	118.50
Elev	656	**Rwy/Length/ILS/ID**	17/12205
Lat	N33°21'		35/12205/109.90/NR
Long	W07°34'		

Lagos, Nigeria – Murtala Muhammed

Ident	LOS	**ATIS**	123.80
Elev	135	**Rwy/Length/ILS/ID**	01R/9006/110.30/ILO
Lat	N06°34'		19L/9006
Long	E03°19'		01L/12795/109.30/ILC
			19R/12795/109.30/ILB

Seychelles, Seychelles Islands – Seychelles Intl

Ident	SEZ	**ATIS**	118.30
Elev	10	**Rwy/Length/ILS/ID**	13/9800
Lat	S04°40'		31/9800/110.30/SIA
Long	E55°31'		

Capetown, South Africa – D F Malan

Ident	CPT	**ATIS**	118.10
Elev	151	**Rwy/Length/ILS/ID**	01/10502/110.30/CT
Lat	S33°58'		19/10502/109.10/KS
Long	E18°36'		16/5581
			34/5581

Johannesburg, South Africa – Jan Smuts

Ident	JNB	**ATIS**	118.10
Elev	5558	**Rwy/Length/ILS/ID**	03L/14495/110.30/JS
Lat	S26°08'		21R/14495
Long	E28°14'		03R/11155/109.10/JN
			21L/11155/109.90/JA
			15/9285
			33/9285

Khartoum, Sudan – Khartoum

Ident	KRT	**ATIS**	119.20
Elev	1261	**Rwy/Length/ILS/ID**	18/9843/110.90/KIS
Lat	N15°36'		36/9843/110.30/KIN
Long	E32°33'		

Kinshasa, Zaire – N'Djili Intl

Ident	FIH	**ATIS**	118.10
Elev	1027	**Rwy/Length/ILS/ID**	06/11811
Lat	S04°23'		24/11811/110.30/KSA
Long	E15°27'		

VORs

Location/Name	Ident	Freq	Lat	Long
Canary Islands				
Fuerteventura	FTV	114.10	N28°26'	W13°51'
Gran Canaria	GDV	112.90	N28°04'	W15°25'
Lanzarote	LT	113.70	N28°56'	W13°36'
Lanzarote	LZR	115.20	N29°09'	W13°30'
Tenerife	TFN	112.50	N28°32'	W16°16'
Tenerife-South	TFS	116.40	N28°00'	W16°41'
Egypt				
Cairo	CAI	112.50	N30°09'	E31°25'
Cairo	CVO	115.20	N30°05'	E31°23'
Fayoum	FYM	117.30	N29°25'	E30°21'
Kenya				
Anthi River	TV	115.50	S01°30'	E37°01'
Lodwar	LOV	114.50	N03°07'	E35°37'
Nairobi	NI	113.10	S01°17'	E36°57'
Nakuru	NAK	115.10	S00°18'	E36°09'
Ngong	GV	115.90	S01°23'	E36°38'
Ivory Coast				
Abidjan	AD	114.30	N05°16'	W03°56'
Libya				
Djanet	DJA	114.10	N24°16'	E09°26'
Madagascar				
Antananarivo	TVN	114.50	S18°48'	E47°31'
Toamasina	MT	113.10	S18°07'	E49°23'
Morocco				
Casablanca	CBA	116.90	N33°31'	W07°40'
Casablanca-Mohamed V	BRC	114.00	N33°17'	W07°33'
Rabat-Sale	RBT	116.50	N34°03'	W06°44'
Nigeria				
Cotonou	TYE	113.30	N06°21'	E02°23'
Ibadan	IB	112.10	N07°20'	E03°58'
Lagos	LG	113.70	N06°42'	E03°19'
Seychelles Islands				
Praslin	PRA	115.70	S04°18'	E55°42'
Seychelles	SEY	113.10	S04°40'	E55°32'
South Africa				
Cape Town	CTV	115.70	S33°58'	E18°36'
Grasmere	GAV	115.50	S26°30'	E27°40'
Hartebeespoortdam	HBV	112.10	S25°40'	E27°50'
Heidelberg	HGV	116.70	S26°41'	E28°17'
Jan Smuts	JSV	115.20	S26°09'	E28°13'
Lanseria	LAV	114.50	S25°56'	E27°55'
Witbank	WIV	113.30	S25°49'	E29°11'
Sudan				
Khartoum	KTM	112.10	N15°35'	E32°33'
Merowe	MRW	116.00	N18°24'	E31°49'
Zaire				
Brazzaville	BZ	113.10	S04°14'	E15°15'
Kinshasa	KSA	115.00	S04°24'	E15°25'
Zimbabwe				
Fydle	VFY	114.90	S18°10'	E29°59'
Harare	VSB	113.10	S17°54'	E31°07'

NDBs

Location/Name	Ident	Freq	Lat	Long
Canary Islands				
Gran Canaria	VR	365	N27°51'	W15°25'
Hierro	HR	376	N27°48'	W17°53'
Tenerife	FP	420	N28°29'	W16°22'
Egypt				
Cairo	OR	284	N30°02'	E31°19'
Cairo	OL	361	N30°09'	E31°28'
Moquattam	MKT	317	N30°02'	E31°16'
Nasar	NSR	340	N30°04'	E31°18'
Ivory Coast				
Abidijan	PB	294	N05°14'	W03°57'
Abidijan	AN	306	N05°20'	W03°53'
Afiendu	IVY	393	N05°24'	W02°55'
Kenya				
Athi River	TH	329.5	S01°30'	E37°01'
Embakasi	AL	379	S01°22'	E36°56'
Nairobi	NO	278	S01°21'	E36°51'
Nairobi	NI	283	S01°20'	E36°54'
Narok	NK	368	S01°06'	E35°51'
Ngong	GG	315	S01°23'	E36°38'
Libya				
Dijanet	DJA	274	N24°16'	E09°26'
Ghat	GHT	368	N25°11'	E10°08'
Madagascar				
Ankazobe	TN	385	S18°18'	E47°06'
Ivato	IO	305	S18°47'	E47°23'
Ivato	NT	340	S18°49'	E47°36'
Maromamy	MMY	267	S18°48'	E49°01'
Moramanga	TE	371	S18°57'	E48°13'
Morocco				
Ben Slimane	CAE	275	N33°37'	W07°07'
Casablanca	NSR	282	N33°17'	W07°33'
Casablanca	NUA	255	N33°25'	W07°36'
Daquartt	CSD	345	N32°56'	W08°03'
Nigeria				
Ibadan	IB	400	N07°26'	E03°55'
Lagos	LB	368	N06°35'	E03°18'
Lagos	LA	336	N06°36'	E03°03'
Okitipupa	OK	345	N06°30'	E04°50'
Seychelles Islands				
Seychelles	SEY	373	S04°36'	E55°26'
South Africa				
Cape Town	CT	400	S34°02'	E18°37'
Cape Town	CB	462.5	S33°52'	E18°34'
Cape Town	CA	282.5	S33°59'	E18°36'
Clanwilliam	CW	372.5	S32°11'	E18°53'
Greyton	GE	270	S34°03'	E19°36'
Jan Smuts	JA	445	S26°04'	E28°15'
Jan Smuts	JS	220	S26°12'	E28°12'
Jan Smuts	JL	250	S26°09'	E28°13'
Jan Smuts	JN	420	S26°13'	E28°13'
Jan Smuts	JB	202	S26°02'	E28°15'
Meyerton	MT	385	S26°33'	E28°02'
New Largo	NL	367.5	S25°55'	E28°57'
Robben Island	ZUI	310.3	S33°48'	E18°22'
Sir Lowry's Pass	SP	222.5	S34°08'	E18°56'
Val	VAL	345	S26°47'	E28°55'
Wolseley	WY	247.5	S33°24'	E19°11'
Sudan				
Khartoum	KIS	358	N15°40'	E32°33'
Khartoum	KIN	335	N15°31'	E32°33'
Khartoum	KH	329	N15°38'	E32°33'
Zaire				
Brazzaville	BL	355	S04°18'	E15°11'
Kinshasa	OK	340	S04°20'	E15°31'
Zimbabwe				
Bromley	KU	363	S18°04'	E31°20'
Harare	OL	346	S17°59'	E31°01'
Makumbi	BZ	284	S17°31'	E31°15'
Norton	NZ	373	S17°53'	E30°41'
Zisco	RC	385	S19°00'	E29°42'

ASIA

Airports

Den Pasar, Bali – Bali Intl

Ident	DPS	**ATIS**	126.20
Elev	22	**Rwy/Length/ILS/ID**	09/9843/110.30/IDPS
Lat	S08°45'		27/9843/110.30/IDPS
Long	E115°10'		

Beijing, China – Capital

Ident	PEK	**ATIS**	127.6
Elev	118	**Rwy/Length/ILS/ID**	18L/12467/109.3/IOR
Lat	N40°04'		36R/12467/109.9/IQU
Long	E116°35'		18R/10499/110.3/ILG
			36L/10499/111.7/IDK

Shanghai, China – Hongqiao

Ident	SHA	**ATIS**	118.10
Elev	10	**Rwy/Length/ILS/ID**	18/10499/110.30/IPK
Lat	N31°12'		36/10499/110.30/IWB
Long	E121°20'		

Bombay, India – Bombay

Ident	BOM	**ATIS**	126.40
Elev	27	**Rwy/Length/ILS/ID**	9/11445
Lat	N19°05'		27/11445/110.30/SCZ
Long	E72°51'		14/8956
			32/8956

Calcutta, India – Calcutta

Ident	CCU	**ATIS**	126.40
Elev	17	**Rwy/Length/ILS/ID**	01L/7854
Lat	N22°39'		19R/7854
Long	E88°26'		01R/11900/109.90/CAL
			19L/11900/110.30/DUM

Ghat, India – Ghat

Ident	GHT	**ATIS**	—
Elev	2296	**Rwy/Length**	06/4921
Lat	N25°08'		24/4921
Long	E10°08'		17/11811
			35/11811

Atsugi, Japan – Atsugi Aero

Ident	—	**ATIS**	—
Elev	205	**Rwy/Length/ILS/ID**	01//111.3/IAG
Lat	N35°26'		
Long	E139°27'		

Camp Zama, Japan – Kastner AAF

Ident	—	**ATIS**	—
Elev	359	**Rwy/Length**	—
Lat	N35°30'		
Long	E139°24'		

Chofu, Japan – Chofu

Ident	—	**ATIS**	—
Elev	135	**Rwy/Length**	—
Lat	N35°40'		
Long	E139°32'		

Hyakuri, Japan – Hyakuri Aero

Ident	—	**ATIS**	—
Elev	105	**Rwy/Length/ILS/ID**	03//109.3/IHY
Lat	N36°10'		
Long	E140°25'		

Iruma, Japan – Iruma

Ident	—	**ATIS**	—
Elev	299	**Rwy/Length**	—
Lat	N35°50'		
Long	E139°24'		

Kasumigaura, Japan – Kasumigaura

Ident	—	**ATIS**	—
Elev	85	**Rwy/Length**	—
Lat	N36°01'		
Long	E140°11'		

Kisarazu, Japan – Kisarazu Aero

Ident	—	**ATIS**	—
Elev	10	**Rwy/Length**	—
Lat	N35°23'		
Long	E139°54'		

Kushiro, Japan – Kushiro

Ident	KUH	**ATIS**	118.05
Elev	311	**Rwy/Length/ILS/ID**	17/7546/108.90/IKS
Lat	N43°02'		35/7546
Long	E144°11'		

Matsudo, Japan – Shimofusa Aero

Ident	—	**ATIS**	—
Elev	98	**Rwy/ILS/ID**	18/109.1/ISH
Lat	N35°47'		
Long	E140°01'		

Matsumoto, Japan – Matsumoto

Ident	—	**ATIS**	—
Elev	2157	**Rwy/Length**	—
Lat	N36°09'		
Long	E137°55'		

Oshima, Japan – Oshima

Ident	—	**ATIS**	—
Elev	125	**Rwy/Length**	—
Lat	N34°46'		
Long	E139°21'		

Tachikawa, Japan – Tachikawa

Ident	—	**ATIS**	—
Elev	313	**Rwy/Length**	—
Lat	N35°42'		
Long	E139°24'		

Tateyama, Japan – Tateyama

Ident	—	**ATIS**	—
Elev	10	**Rwy/Length**	—
Lat	N34°59'		
Long	E139°53'		

Tokyo, Japan – Haneda

Ident	HND	**ATIS**	128.80
Elev	15	**Rwy/Length/ILS/ID**	4/8202
Lat	N35°32'		22/8202/111.70/IAD
Long	E139°46'		15/10335
			33/10335/110.90/IHM
			16/9843
			34/9843/110.10/IHA

Tokyo, Japan – New Tokyo Intl. Narita

Ident	—	**ATIS**	128.25
Elev	135	**Rwy/Length/ILS/ID**	16//111.5/IKF
Lat	N35°45'		34//111.9/IYQ
Long	E140°23'		

Tokyo, Japan – Yokota AB

Ident	—	**ATIS**	128.4
Elev	457	**Rwy/Length/ILS/ID**	36//109.7/IYOK
Lat	N35°44'		
Long	E139°21'		

Yaizu, Japan – Shizuhama Aero

Ident	—	**ATIS**	—
Elev	23	**Rwy/Length**	—
Lat	N34°48'		
Long	E138°18'		

Hong Kong, Hong Kong – Intl

Ident	HKG	**ATIS**	128.20
Elev	15	**Rwy/Length/ILS/ID**	13/10930/111.90/KL
Lat	N22°18'		31/10930/109.90/IHK
Long	E114°12'		

Male, Maldives – Male Intl

Ident	MLE	**ATIS**	118.10
Elev	4	**Rwy/Length/ILS/ID**	18/10499
Lat	N04°11'		36/10499/108.70/IML
Long	E73°32'		

Ulaanbaatar, Mongolia – Buyant-Ukhaa

Ident	ULN	**ATIS**	—
Elev	4314	**Rwy/Length**	14/10170
Lat	N47°50'		32/10170
Long	E106°46'		01/5905 Grass
			19/5905 Grass
			14/7217 Grass
			32/7217 Grass
			15/6561 Grass
			33/6561 Grass

Karachi, Pakistan – Quaid-E-Azam Intl

Ident	KHI	**ATIS**	126.70
Elev	100	**Rwy/Length/ILS/ID**	07L/10500/
Lat	N24°54'		25R/10500/109.70/ICZ
Long	E67°09'		07R/7500
			25L/7500

Manila, Philippines – Ninoy Aquino Intl

Ident	MNL	**ATIS**	126.40
Elev	75	**Rwy/Length/ILS/ID**	6/11004/109.10/IML
Lat	N14°30'		24/11004/109.90/IMA
Long	E121°01'		13/7959
			31/7959

Bratsk, Russia – Bratsk

Ident	BTK	**ATIS**	—
Elev	1609	**Rwy/Length/ILS/ID**	12/10335/110.30/IBS
Lat	N56°22'		30/10335/110.30/IBS
Long	E101°41'		12/6562 Grass
			30/6562 Grass

Moscow, Russia – Domodedovo

Ident	—	**ATIS**	128.3
Elev	587	**Rwy/Length/ILS/ID**	32R//111.9/IDE
Lat	N55°24'		14L//108.5/IDW
Long	E37°54'		32L//109.3/IDO
			14R//110.1/IDM

Moscow, Russia – Sheremetyevo

Ident	SVO	**ATIS**	126.37
Elev	627	**Rwy/Length/ILS/ID**	07R/12139/109.10/INL
Lat	N55°58'		25L/12139/110.50/IBW
Long	E37°24'		

Moscow, Russia – Vnukovo

Ident	—	**ATIS**	125.87
Elev	686	**Rwy/Length/ILS/ID**	02//111.7/IWM
Lat	N55°35'		24//111.1/IOB
Long	E37°16'		06//108.9/IGG
			20//111.5/ITQ

Novosibirsk, Russia – Tolmachevo

Ident	OVB	**ATIS**	—
Elev	364	**Rwy/Length/ILS/ID**	03/3281
Lat	N55°01'		21/3281
Long	E82°40'		06/3281 Grass
			24/3281 Grass
			07/11808/110.10/IRO
			25/11808/108.50/IKT
			07/9843 Grass
			25/9843 Grass
			17/3281
			35/3281

Orenburg, Russia – Orenburg Central

Ident	REN	**ATIS**	128.00
Elev	387	**Rwy/Length/ILS/ID**	08/8202/109.90/IWP
Lat	N51°47'		26/8202/109.30/ILM
Long	E55°27'		08/8202 Grass
			26/8202 Grass
			04/2297
			22/2297
			17/2133
			35/2133

Petropavlovsk-Kamchatsky, Russia – Yelizovo

Ident	PKC	**ATIS**	—
Elev	131	**Rwy/Length/ILS/ID**	16L/11155/110.30/IPR
Lat	N53°10'		34R/11155/110.30/IPR
Long	E158°27'		16R/8202
			34L/8202

Changi, Singapore – Changi

Ident	SIN	**ATIS**	128.60
Elev	22	**Rwy/Length/ILS/ID**	02L/13123/110.90/ICW
Lat	N01°21'		20R/13123/108.90/ICH
Long	E103°59'		02R/13123/108.30/ICE
			20L/13123/109.70/ICC

Seoul, South Korea – Kimpo Intl

Ident	SEL	**ATIS**	126.40
Elev	58	**Rwy/Length/ILS/ID**	14R/10499/110.10/IOFR
Lat	N37°33'		32L/10499
Long	E126°47'		14L/11811/109.90/ISEL
			32R/11811/110.70/ISKP

Columbo, Sri Lanka – Katunayake

Ident	CMB	**ATIS**	118.70
Elev	29	**Rwy/Length/ILS/ID**	4/10991/110.30/IKA
Lat	N07°10'		22/10991
Long	E79°53'		

Kaohsiung, Taiwan – Kaohsiung Intl

Ident	KHH	**ATIS**	127.80
Elev	31	**Rwy/Length/ILS/ID**	09R/10007
Lat	N22°34'		27L/10007
Long	E120°20'		09L/10335/108.30/IKHG
			27R/10335

Bangkok, Thailand – Bangkok Intl

Ident	BKK	**ATIS**	126.40
Elev	9	**Rwy/Length/ILS/ID**	03R/11483
Lat	N13°54'		21L/11483/110.30/IDMG
Long	E100°36'		03L/12139
			21R/12139/109.30/IBKK

VORs

Location/Name	Ident	Freq	Lat	Long
Hong Kong				
Cheung Chau	CH	112.30	N22°13'	E114°01'
Tathong Point	TH	115.50	N22°14'	E114°17'
Tung Lung	TD	116.10	N22°15'	E114°17'
India				
Aurangabad	AAU	116.30	N19°51'	E75°23'
Bombay	BBB	116.60	N19°05'	E72°52'
Calcutta	CEA	112.50	N22°38'	E88°27'
Daman	DMN	113.30	N20°26'	E72°51'
Jamshedpur	JJS	115.40	N22°48'	E86°10'
Rajshahi	RAJ	114.60	N24°26'	E88°37'
Japan				
Ami	TLE	116.00	N36°01'	E140°12'
Choshi	CVC	113.60	N35°43'	E140°48'
Hammatsu	LHE	110.00	N34°44'	E137°41'
Haneda	HME	109.40	N35°32'	E139°46'
Japan (continued)				
Kisarazu	KZE	114.50	N35°23'	E139°54'
Kohtoh	KWE	115.00	N35°36'	E139°49'
Kushiro	KSE	112.50	N43°01'	E144°12'
Memanbetsu	TBE	110.85	N43°52'	E144°10'
Monbetsu	MVE	110.00	N44°15'	E143°31'
Moriya	SNE	114.00	N35°55'	E139°59'
Nakashibetsu	NSE	115.60	N43°34'	E144°57'
Obihiro	OBE	109.65	N42°43'	E143°13'
Onjuku	OJC	115.70	N35°10'	E140°22'
Sakuri	TYE	112.70	N35°46'	E140°16'
Sekiyado	SYE	117.00	N36°00'	E139°50'
Tateyama	PQE	112.50	N34°56'	E139°53'
Yokosuka	HYE	116.20	N35°15'	E139°35'
Korea				
Anyang	SEL	115.10	N37°24'	E126°55'
Kimpo	KIP	113.60	N37°33'	E126°47'
Osan	OSN	114.70	N37°05'	E127°01'
Pyongtaek	PTK	108.20	N36°58'	E127°01'
Seoul	KSM	113.00	N37°26'	E127°06'
Indonesia				
Bali	BLI	116.20	S08°45'	E115°09'
Maldives				
Male	MLE	114.70	N04°11'	E73°32'
Pakistan				
Karachi	KC	112.10	N24°54'	E67°10'
Nawabshah	NH	112.90	N26°13'	E68°23'
Phillipines				
Cabanatuan	CAB	112.70	N15°27'	E120°58'
Jomalig	JOM	116.70	N14°43'	E122°24'
Lipa	LIP	115.10	N13°57'	E121°07'
Manila	MIA	113.80	N14°30'	E121°01'
Russia				
Bratsk	BRT	113.60	N56°22'	E101°41'
Sheremetyevo	MR	114.60	N55°57'	E37°20'

Location/Name	Ident	Freq	Lat	Long
Singapore				
Batum	BTM	116.00	N01°08'	E104°07'
Johor Bahru	VJR	112.70	N01°43'	E103°37'
Papa Uniform	PU	115.10	N01°25'	E103°56'
Sinjon	SJ	113.50	N01°13'	E103°51'
Tekong	VTK	116.50	N01°24'	E104°01'
Sri Lanka				
Batticaloa	BAT	114.60	N07°42'	E81°40'
Columbo Katunayake	KAT	112.70	N07°09'	E79°52'
Columbo Ratmalana	RML	116.70	N06°49'	E79°53'
Taiwan				
Green I	GID	116.90	N22°40'	E121°28'
Hengchun	HCN	113.70	N21°55'	E120°50'
Shikang	TNN	113.30	N23°08'	E120°11'
Thailand				
Bangkok	BKK	115.90	N13°59'	E100°39'
Korat	KRT	113.70	N14°55'	E102°07'
U-Taphao	BUT	110.80	N12°39'	E101°00'

NDBs

Location/Name	Ident	Freq	Lat	Long
China				
Shanghi	PK	369	—	—
Shanghi	CU	280	—	—
Shanghi	BF	528	—	—
Shanghi	WB	240	—	—
Hong Kong				
Cape D'anguilar	HKG	338	N22°13'	E114°14'
Cheung Chau	CC	360	N22°12'	E114°01'
Hong Kong Intl	RW	337	N22°12'	E114°11'
Sha Lo Wan	SL	286	N22°17'	E113°54'
Sheremetyevo	NL	380	N55°57'	E037°19'
Stonecutters	SC	236	N22°19'	E114°07'
Tathong Point	TH	280	N22°14'	E114°17'
India				
Berachampa	BC	220	N22°42'	E88°42'
Bombay	BB	265	N19°07'	E72°00'
Indonesia				
Den Pasar	OR	230	S08°44'	E115°10'
Mataram	GA	330	S08°33'	E116°05'
Japan				
Akan	KQ	221	N43°08'	E144°08'
Arakawa	AD	385	N35°38'	E139°50'
Haneda	HME	337	N35°33'	E139°45'
Kisarazu	CL	200	N35°23'	E139°54'
Kushiro	KS	194	N43°02'	E144°12'
Kuzumi	KF	342	N35°49'	E140°19'
Tateyama	PQ	373	N34°59'	E139°52'
Tokachi	OH	239	N42°52'	E143°09'
Yokoshiba	YQ	256	N35°40'	E140°26'
Korea				
Anyang	SL	336	N37°24'	E126°55'
Korea	0F	246	N37°36'	E126°43'
Korea	SE	219	N37°36'	E126°43'
Seoul	CP	388	N37°26'	E127°05'
Pakistan				
Cape Manze	KA	244	N24°50'	E66°40'
Gharo	KF	296	N24°46'	E67°34'
Hyderabad	KD	223	N25°18'	E68°23'
Karachi	MR	354	N24°56'	E66°56'
Karachi	KC	271	N24°53'	E67°10'
Philippines				
Alabat	AL	247	N14°14'	E121°55'
Manila	MIA	389	N14°30'	E121°01'
Manila	OL	375	N14°32'	E121°05'
Rizal	RZL	327	N14°28'	E121°11'
Rosario	RS	285	N14°25'	E120°51'

Location/Name	Ident	Freq	Lat	Long
Russia				
Borovoye	JK	816	N54°40'	E82°37'
Buzharovo	AR	1080	N55°59'	E36°48'
Kolyvan	GV	660	N55°19'	E82°43'
Kostino	KN	642	N56°18'	E37°43'
Legostayevo	OC	320	N54°38'	E83°49'
Malka	MK	345	N53°19'	E157°32'
Matveyevsky	EB	1170	N54°56'	E83°05'
Novosibirsk	KT	310	N55°01'	E82°44'
Novosibirsk	RO	310	N55°00'	E82°33'
Novotryshkino	KD	715	N55°17'	E82°24'
Opalikha	KS	565	N55°50'	E37°16'
Orenburg	LM	415	N51°47'	E55°32'
Orenburg	WP	415	N51°47'	E55°22'
Petropavlovsk -Kamchatsky	Q	1040	N53°11'	E158°26'
Petropavlovsk-Kamchatsky	PR	535	N53°06'	E158°29'
Pretoriia	PO	730	N52°15'	E54°19'
Savelovo	SW	1285	N56°22'	E37°26'
Sheremetyevo	NL	380	N55°57'	E37°19'
Sheremetyevo	MR	700	N55°57'	E37°19'
Sheremetyevo	BW	380	N55°59'	E37°30'
Sheremetyevo	AD	700	N55°59'	E37°30'
Talmenka	TM	988	N53°48'	E83°32'
Ust-Bolsheretsk	UB	907	N52°49'	E156°16'
Zaeltsovsky	PG	860	N55°05'	E82°54'
Zheltoie	VL	1005	N51°38'	E56°36'
Singapore				
Bedok	BED	232	N01°19'	E103°57'
Jaybee	JB	400	N01°29'	E103°43'
Kong Kong	KK	286	N01°31'	E103°59'
Tanjung Pinang	TI	385	N00°55'	E104°32'
Tekong	TEK	259	N01°25'	E104°01'
Sri Lanka				
Katunayake	CNL	315	N07°16'	E79°56'
Katunayake	ASL	330	N07°07'	E79°50'
Ratmalana	RM	350	N06°50'	E79°53'
Taiwan				
Hengchun	KW	415	N21°56'	E120°49'
Kaohsiung	CO	220	N22°34'	E120°17'

Location/Name	Ident	Freq	Lat	Long
Thailand				
Bangkok	BK	293	N13°59'	E100°39'
Prachin Buri	PB	201	N14°06'	E101°22'

CANADA

Airports

Calgary, Canada – Calgary Intl

Ident	YYC	**ATIS**	---
Elev	3557	**Rwy/Length/ILS/ID**	7/6200
Lat	N51°06'		25/6200
Long	W114°01'		10/8000/110.90/IAQ
			28/8000/110.90/IAQ
			16/12675/109.30/IEM
			34/12675/111.50/NC

Edmonton, Canada – Edmonton Intl

Ident	YEG	**ATIS**	128.00
Elev	2373	**Rwy/Length/ILS/ID**	2/11000/110.30/IEG
Lat	N53°18'		20/11000
Long	W113°34'		12/10200/109.90/IFP
			30/10200/109.10/IKB

Gander, Canada – Gander Intl

Ident	YQX	**ATIS**	124.80
Elev	496	**Rwy/Length/ILS/ID**	04/10500/109.50/IQX
Lat	N48°56'		22/10500/109.90/IGN
Long	W54°34'		13/8900
			31/8900

Goose Bay, Canada – Goose Bay

Ident	YYR	**ATIS**	128.10
Elev	160	**Rwy/Length/ILS/ID**	8/11046/110.30/IVR
Lat	N53°19'		26/11046
Long	W60°25'		16/9580
			34/9580

Toronto, Canada – Buttonville Muni

Ident	—	**ATIS**	127.1
Elev	650	**Rwy/Length/ILS/ID**	15//111.1/IKZ
Lat	N43°51'		
Long	W79°22'		

Toronto, Canada – Toronto/City Center

Ident	—	**ATIS**	133.6
Elev	251	**Rwy/Length**	—
Lat	N43°37'		
Long	W79°23'		

Toronto, Canada – Pearson Intl

Ident	YYZ	**ATIS**	120.82
Elev	569	**Rwy/Length/ILS/ID**	06R/9500/109.10/IJS
Lat	N43°40'		24L/9500/109.30/INV
Long	W79°37'		06L/10500/109.70/ITX
			24R/10500/111.50/IYZ
			15/11050/110.50/IRW
			33/11050/110.30/ILE

Vancouver, Canada – Coal Harbour / Intl

Ident	YVR	**ATIS**	124.60
Elev	9	**Rwy/Length/ILS/ID**	8/11000/109.50/IVR
Lat	N49°11'		26/11000/110.70/IFZ
Long	W123°11'		12/7300/111.10/IMK
			30/7300
			26A/3500

Godthab, Greenland – Godthab

Ident	GOH	**ATIS**	119.10
Elev	283	**Rwy/Length**	06/3117
Lat	N64°11'		
Long	W51°41'		

VORs

Location/Name	Ident	Freq	Lat	Long
Alberta				
Calgary	YYC	116.70	N51°06'	W113°52'
Edmonton	VEG	117.60	N53°11'	W113°52'
Empress	YEA	115.90	N50°55'	W109°59'
Alberta (continued)				
Grande Prairie	YQU	113.10	N55°10'	W119°01'
High Level	YOJ	113.30	N58°33'	W117°05'
Lethbridge	YQL	115.70	N49°38'	W112°40'
Medicine Hat	YXH	116.50	N49°57'	W110°48'
Peace River	YPE	117.20	N56°12'	W117°30'
Rocky Mountain	YRM	114.30	N52°30'	W115°19'
Spring Bank	YBW	108.60	N51°06'	W114°22'
Wainwright	YWV	114.50	N52°58'	W110°50'
Whitecourt	YZU	112.50	N54°08'	W115°47'
British Columbia				
Cranbrook	YXC	112.10	N49°33'	W116°05'
Enderby	YNY	115.20	N50°40'	W118°56'
Fort Nelson	YYE	112.90	N58°53'	W123°00'
Fort Saint John	YXJ	114.20	N56°17'	W120°53'
Port Hardy	YZT	112.00	N50°41'	W127°21'
Prince George	YXS	112.30	N53°53'	W122°27'
Princeton	YDC	113.90	N49°22'	W120°22'
Sandspit	YZP	114.10	N53°15'	W131°48'
Vancouver	YVR	115.90	N49°04'	W123°09'
Victoria	YYJ	113.70	N48°43'	W123°29'
Williams Lake	YWL	113.60	N52°14'	W122°10'
Manitoba				
Brandon	YBR	113.80	N49°54'	W99°56'
Churchill	YYQ	114.10	N58°44'	W94°08'
Dauphin	YDN	116.10	N51°06'	W100°03'
Langruth	VLR	112.20	N50°25'	W98°43'
Lynn Lake	YYL	112.60	N56°51'	W101°04'
Portage	YPG	114.60	N49°53'	W98°16'
The Pas	YQD	113.60	N53°58'	W101°06'
Winnipeg	YWG	115.50	N49°55'	W97°14'
Northwest Territories				
Baker Lake	YBK	114.50	N64°19'	W96°06'
Cambridge Bay	YCB	112.70	N69°07'	W105°10'
Fort Good Hope	YGH	112.30	N66°14'	W128°37'
Fort Simpson	YFS	117.90	N61°46'	W121°17'
Hall Beach	YUX	117.30	N68°46'	W81°14'
Norman Wells	YVQ	112.70	N65°15'	W126°43'
Wrigley	YWY	113.10	N63°11'	W123°21'
Yellowknife	YZF	115.50	N62°27'	W114°26'

Location/Name	Ident	Freq	Lat	Long
New Bruswick				
Fredericton	YFC	113.00	N45°53'	W66°25'
Moncton	YQM	117.30	N46°11'	W64°34'
Saint John	YSJ	113.50	N45°24'	W65°52'
Newfoundland				
Deer Lake	YDF	113.30	N49°14'	W57°12'
Gander	YQX	112.70	N48°54'	W54°32'
Goose	YYR	117.30	N53°19'	W60°17'
St Johns	UYT	108.60	N47°37'	W52°44'
Stephenville	YJT	113.10	N48°34'	W58°40'
Torbay	YYT	113.50	N47°29'	W52°51'
Nova Scotia				
Halifax	YHZ	115.10	N44°55'	W63°24'
Sydney	YQY	114.90	N46°09'	W60°03'
Ontario				
Ameson	YAN	112.40	N49°46'	W84°35'
Coehill	VIE	115.10	N44°39'	W77°53'
Geraldton	YGQ	114.20	N49°46'	W86°59'
Killaloe	YXI	115.60	N45°39'	W77°36'
London	YXU	117.20	N43°02'	W81°08'
Mans	YMS	114.50	N44°08'	W80°08'
Marathon	YSP	115.90	N48°44'	W86°19'
Midland	YEE	112.80	N44°34'	W79°47'
Moosenee	YMO	112.90	N51°17'	W80°36'
North Bay	YYB	115.40	N46°21'	W79°26'
Ottawa	YOW	114.60	N45°26'	W75°53'
Red Lake	YRL	114.00	N51°04'	W93°45'
Simcoe	YSO	117.35	N44°14'	W79°10'
Sioux Narrows	VBI	115.20	N49°28'	W94°02'
Stirling	VQC	113.50	N44°23'	W77°43'
Sudbury	YSB	112.30	N46°37'	W80°47'
Thunder Bay	YQT	114.10	N48°15'	W89°26'
Timmins	YTS	113.00	N48°34'	W81°22'
Toronto	YYZ	113.30	N43°40'	W79°38'
Waterloo	YWT	115.00	N43°27'	W80°22'
Wawa	YXZ	112.70	N47°57'	W84°49'
Wiarton	YVV	117.70	N44°44'	W81°06'
Windsor	YQG	113.80	N42°14'	W82°49'

Location/Name	Ident	Freq	Lat	Long
Prince Edward Island				
Charlottetown	YYG	114.10	N46°12'	W62°58'
Quebec				
Bagotville	XBG	111.80	N48°19'	W70°59'
Baie-Comeau	YBC	117.70	N49°08'	W68°13'
Beauce	VLV	117.20	N45°55'	W70°50'
Gaspe	YGP	115.40	N48°45'	W64°24'
Grindstone	YGR	112.00	N47°25'	W61°46'
Mirabel	YMX	116.70	N45°53'	W74°22'
Mont Joli	YYY	115.90	N48°36'	W68°12'
Montreal	YUL	116.30	N45°36'	W73°58'
Quebec	YQB	112.80	N46°42'	W71°37'
Riviere Du Loup	YRI	113.90	N47°45'	W69°35'
Saguenay	VBS	114.20	N48°01'	W71°15'
Sept-Iles	YZV	114.50	N50°13'	W66°16'
Sherbrooke	YSC	113.20	N45°18'	W71°47'
St Jean	YJN	115.80	N45°15'	W73°19'
Val-D'or	YVO	113.70	N48°10'	W77°49'
Saskatchewan				
Broadview	YDR	117.50	N50°21'	W102°32'
Lumsden	VLN	114.20	N50°40'	W104°53'
Prince Albert	YPA	113.00	N53°12'	W105°39'
Saskatoon	YXE	116.20	N52°10'	W106°43'
Swift Current	YYN	117.40	N50°17'	W107°41'
Yorkton	YQV	115.80	N51°15'	W102°28'
Yukon Territory				
Watson Lake	YQH	114.90	N60°05'	W128°51'
Whitehorse	YXY	116.60	N60°37'	W135°08'

NDBs

Location/Name	Ident	Freq	Lat	Long
Alberta				
Calgary	YC	344	N51°04'	W113°54'
Echo	E	254		
Echo	E	308	N53°15'	W113°39'
Edmonton	XD	266	N53°38'	W113°30'

Location/Name	Ident	Freq	Lat	Long
Alberta (continued)				
Foxtrot	F	292	N53°21'	W113°40'
Golf	G	379	N53°23'	W113°29'
Kilo	K	215	N53°14'	W113°29'
Lethbridge	QL	248	N49°36'	W112°53'
Medicine Hat	XH	332	N50°00'	W110°47'
Rainbow Lake	YOP	344	N58°27'	W119°15'
Shell	B2	352	N57°22'	W119°47'
Turner Valley	TV	295	N50°45'	W114°22'
Vulcan	Z5	274	N50°24'	W113°16'
Xray	X	201	—	—
Yankee	Y	233	N51°02'	W114°01'
British Columbia				
Abbotsford	XX	344	N49°00'	W122°29'
Active Pass	AP	378	N48°52'	W123°17'
Anahim Lake	UAB	200	N52°22'	W125°10'
Atlin	YSQ	260	N59°37'	W133°40'
Bella Bella	YJQ	325	N52°11'	W128°06'
Campbell River	YBL	203	N50°00'	W125°21'
Cape Scott	ZES	353	N50°46'	W128°25'
Carmi	YXO	335	N49°29'	W119°05'
Castlegar	CG	227	N49°26'	W117°34'
Chetwynd	F6	210	N55°41'	W121°32'
Comox	QQ	400	N49°45'	W124°57'
Cranbrook	XC	242	N49°40'	W115°46'
Cultus	LU	241	N49°01'	W122°02'
Dawson Creek	DQ	394	N55°43'	W120°04'
Egg Island	UEM	207	N51°14'	W127°50'
Enderby	NY	350	N50°38'	W118°55'
Estevan Point	EP	373	N49°23'	W126°32'
Fairmont	D6	261	N50°19'	W115°52'
Fort Nelson	YE	382	N58°47'	W122°43'
Fort St John	XJ	326	N56°17'	W120°50'
Hope	HE	245	N49°23'	W121°25'
Kelowna	LW	257	N50°03'	W119°24'
Kitimat	ZKI	203	N54°03'	W128°40'
Liard River	ZL	263	N59°28'	W126°08'
Mackenzie	2U	284	N55°18'	W123°08'
Masset	1U	278	N54°01'	W132°07'
Mcinnes Island	MS	388	N52°15'	W128°43'
Mill Bay	MB	293	N48°40'	W123°32'
Nanaimo	YCD	251	N49°07'	W123°52'
Naramata	UNT	312	N49°35'	W119°36'
Papa	P	350	N54°18'	W130°27'

Location/Name	Ident	Freq	Lat	Long
British Columbia (continued)				
Pitt Meadows	PK	227	N49°12'	W122°42'
Sandspit	ZP	368	N53°11'	W131°46'
Skeena	TB	254	N54°28'	W128°35'
Skookum	SX	368	N49°57'	W115°47'
Smithers	YD	230	N54°44'	W127°06'
Telkwa (Smithers)	TK	391	N54°40'	W126°59'
Terrace	XT	332	N54°22'	W128°34'
Tofino	YAZ	359	N49°02'	W125°42'
Vancouver	VR	266	N49°10'	W123°03'
Victor	V	368	N49°11'	W123°13'
Victoria	YJ	200	N48°38'	W123°23'
White Rock	WC	332	N49°00'	W122°45'
Greenland				
Godthab	NK	273	N64°40'	W51°22'
Godthab	QT	258	N64°20'	W51°35'
Godthab	GH	314	N64°10'	W51°45'
Manitoba				
Berens River	YBV	370	N52°21'	W97°01'
Brandon	BR	233	N49°54'	W100°04'
Delta	UDE	269	N50°09'	W98°18'
Winnipeg	WG	248	N49°53'	W97°20'
New Brunswick				
Bathurst	2F	382	N47°35'	W65°50'
Charlo	CL	207	N48°00'	W66°26'
Chatham	F9	530	N47°00'	W65°25'
Fredericton	FC	326	N45°55'	W66°35'
Juliet	J	397	N45°13'	W65°57'
Lima	L	281	N47°58'	W66°13'
Moncton	QM	224	N46°06'	W64°34'
St Leonard	YSL	404	N47°12'	W67°52'
Newfoundland				
Channel Head	CM	379	N47°34'	W59°09'
Gander	QX	280	N48°57'	W54°40'
Goose	Y	212	N53°16'	W60°31'
Goose	YR	257	N53°20'	W60°31'
Rigolet	JC	396	N54°10'	W58°26'
Stephenville	JT	390	N48°32'	W58°45'
Torbay	YT	260	N47°40'	W52°48'

Location/Name	Ident	Freq	Lat	Long
Northwest Territories				
Aklavik	YKD	208	N68°13'	W135°00'
Fort Liard	YJF	368	N60°14'	W123°27'
Fort Mcpherson	ZFM	373	N67°24'	W134°52'
Ft Simpson	FS	375	N61°47'	W121°15'
Inuvik	EV	254	N68°19'	W133°35'
Norman Wells	VQ	326	N65°15'	W126°40'
Trout Lake	7I	258	N60°26'	W121°14'
Tuktoyaktuk	UB	380	N69°26'	W133°01'
Wrigley	WY	222	N63°12'	W123°25'
Nova Scotia				
Alfa	A	201	N44°41'	W63°34'
Debert	8F	239	N45°25'	W63°27'
Digby	Y9	220	N44°32'	W65°47'
Golf	G	364	N44°48'	W63°35'
Greenwood	YZX	266	N44°55'	W65°06'
Isle Madame	W	304	N45°33'	W60°55'
Liverpool	A9	330	N44°13'	W64°51'
Sable Island	SA	374	N43°55'	W60°01'
Shearwater	YAW	353	N44°36'	W63°26'
Sydney	QY	263	N46°12'	W59°58'
Trenton	5Y	338	N45°36'	W62°37'
Yarmouth	QI	206	N43°47'	W66°07'
Ontario				
Armstrong	YYW	223	N50°18'	W89°01'
Atikokan	IB	209	N48°49'	W91°34'
Brantford	FD	207	N43°04'	W80°24'
Buttonville	KZ	248	N43°56'	W79°19'
Chapleau	YLD	335	N47°45'	W83°24'
Charlottetown	YG	347	N46°11'	W63°08'
Downsview	YZD	356	N43°45'	W79°28'
Dryden	YHD	413	N49°51'	W92°50'
Earlton	YXR	257	N47°42'	W79°47'
Elliot Lake	YEL	276	N46°22'	W82°37'
Fort Frances	YAG	376	N48°41'	W93°32'
Gibraltar Point	TZ	257	N43°36'	W79°23'
Goderich	GD	286	N43°44'	W81°43'
Golf	G	398	N42°14'	W83°02'
Gore Bay	YZE	245	N45°55'	W82°36'
Gros Cap	A	286	N46°30'	W84°36'
Hamilton	HM	221	N43°07'	W80°00'
Hanover	S7	268	N44°09'	W81°03'

Location/Name	Ident	Freq	Lat	Long
Ontario (continued)				
Juliett	J	236	N43°37'	W79°41'
Kasing	YYU	341	N49°27'	W82°30'
Kenora	YQK	326	N49°47'	W94°25'
Kincardine	D7	350	N44°12'	W81°36'
Kingston	YGK	263	N44°17'	W76°36'
Kirkland	YKX	201	N48°13'	W79°52'
Lima	L	368	N43°37'	W79°32'
London	XU	383	N43°05'	W81°13'
Manitouwadge	YMG	219	N49°02'	W85°54'
Moosonee	MO	224	N51°16'	W80°37'
Muskoka	YQA	272	N45°02'	W79°16'
Nakina	QN	233	N50°10'	W86°37'
North Bay	YB	394	N46°23'	W79°28'
November	N	347	N43°43'	W79°31'
Oscar	O	344	N45°16'	W75°44'
Oshawa	OO	391	N43°55'	W78°54'
Ottawa	OW	236	N45°21'	W75°33'
Pembroke	YTA	409	N45°48'	W77°13'
Red Lake	RL	218	N51°03'	W93°47'
Romeo	R	403	N43°44'	W79°42'
Romeo	R	317	N44°03'	W77°37'
Sandspit	ZP	368	N53°11'	W131°46'
Sierra	S	344	N46°41'	W80°44'
Sioux Lookout	YXL	346	N50°07'	W91°53'
Smith Falls	YSH	334	N44°54'	W76°00'
St Catherines	SN	408	N43°08'	W79°15'
St Thomas	7B	375	N42°46'	W81°06'
Sudbury	SB	362	N46°38'	W80°55'
Tango	T	341	N43°37'	W79°43'
Tango	T	263	N48°23'	W89°13'
Terrace Bay	YTJ	250	N48°47'	W87°09'
Thunder Bay	QT	332	N48°20'	W89°26'
Timmins	TS	212	N48°33'	W81°27'
Trenton	YTR	215	N44°11'	W77°24'
Uplands	YUP	352	N45°13'	W75°29'
Wapisk	YAT	260	N52°55'	W82°26'
Waterloo	K	335	N43°29'	W80°17'
Xray	X	385	N43°44'	W79°34'
Yankee	Y	404	N46°19'	W79°31'
Prince Edward Island				
Charlottetown	YG	347	N46°11'	W63°08'

Location/Name	Ident	Freq	Lat	Long
Quebec				
Amos	9Q	291	N48°33'	W78°14'
Bagotville	YBG	356	N48°20'	W71°08'
Baie-Comeau	BC	414	N49°07'	W68°19'
Bromont	6R	343	N45°14'	W72°47'
Champlain	BV	336	N46°52'	W71°16'
Charlevoix	ML	392	N47°37'	W70°19'
Chiboo	MT	209	N49°47'	W74°29'
Chute-Des-Passes	DG	244	N49°53'	W71°15'
Drummondville	Y8	401	N45°50'	W72°23'
Eastmain	ZEM	338	N52°13'	W78°31'
Forestville	FE	239	N48°44'	W69°06'
Gaspe	GP	232	N48°46'	W64°23'
Grindstone	GR	370	N47°22'	W61°54'
Havre St-Pierre	YGV	344	N50°15'	W63°39'
Heath Point	HP	335	N49°05'	W61°42'
Hotel	H	407	N45°33'	W73°20'
La Tuque	YLQ	289	N47°24'	W72°47'
Lg-4	YFM	332	N53°42'	W73°42'
Lima	L	284	N45°32'	W73°39'
Maniwaki	YMW	366	N46°12'	W75°57'
Mars	URX	269	N48°00'	W70°49'
Matagami	NM	218	N49°43'	W77°44'
Matane	ME	216	N48°50'	W67°32'
Mike	M	348	N45°31'	W73°39'
Mont-Joli	YY	340	N48°34'	W68°15'
Montreal	UL	248	N45°27'	W73°50'
Nemiscau	K8	214	N51°41'	W76°08'
Parent	YPP	303	N47°53'	W74°40'
Rimouski	YXK	373	N48°28'	W68°30'
Riviere Ouelle	Z8	347	N47°26'	W69°58'
Riviere-Du-Loup	RI	201	N47°45'	W69°34'
Ruoyn	YUY	218	N48°10'	W78°56'
Sept-Iles	Z	248	N53°21'	W131°56'
Sept-Iles	ZV	273	N50°12'	W66°09'
Sherbrooke	SC	362	N45°28'	W71°47'
St Bruno De Guigu	YBM	230	N47°27'	W79°25'
Ste-Foy	OU	329	N46°46'	W71°17'
St-Felix-De-Valoi	UFX	260	N46°11'	W73°25'
St-Honore	YRC	213	N48°32'	W71°09'
Thetford Mines	R1	275	N46°02'	W71°16'
Trois-Rivieres	YRQ	205	N46°22'	W72°39'
Uniform	U	201	N45°27'	W73°46'
Val-D'or	VO	239	N48°03'	W77°47'
Victoriaville	F8	384	N46°06'	W71°55'

Location/Name	Ident	Freq	Lat	Long
Quebec (continued)				
Waki	G8	327	N46°16'	W75°59'
Waskaganish	YKQ	351	N51°29'	W78°44'
Saskatchewan				
Beechy	BY	266	N50°50'	W107°27'
Dafoe	VX	368	N51°52'	W104°34'
Estevan	L7	395	N49°12'	W102°51'
Moose Jaw	YMJ	375	N50°17'	W105°26'
Regina	QR	290	N50°22'	W104°34'
Saskatoon	XE	257	N52°11'	W106°48'
Yarmouth	QI	206	N43°47'	W66°07'
Yukon Territory				
Beaver Creek	YXQ	239	N62°24'	W140°51'
Burwash	DB	341	N61°20'	W138°59'
Dawson	DA	214	N64°01'	W139°10'
Faro	ZFA	378	N62°12'	W133°23'
Laberge	JB	236	N60°56'	W135°08'
Lac La Martre	Z3	304	N63°08'	W117°15'
Lakeshore	XG	338	N60°06'	W128°47'
Mayo	MA	365	N63°37'	W135°53'
Old Crow	YOC	284	N67°34'	W139°50'
Robinson	PJ	329	N60°26'	W134°51'
Ross River	YDM	218	N61°58'	W132°25'
Shell	B2	352	N57°22'	W119°47'
Teslin	ZW	269	N60°10'	W132°44'
Watson Lake	QH	248	N60°10'	W128°50'
Whitehorse	XY	302	N60°46'	W135°06'
Xray	X	353	N60°38'	W135°00'

CENTRAL AMERICA

Airports

Belize City, Belize – Philip SW Goldson Intl

Ident	BZE	**ATIS**	118.00
Elev	15	**Rwy/Length**	07/7100
Lat	N17°32'		25/7100
Long	W88°18'		

Bermuda, Bermuda – Bermuda

Ident	BDA	**ATIS**	—
Elev	12	**Rwy/Length**	12/9660
Lat	N32°21'		30/9660
Long	W64°40'		

Guantanamo, Cuba – Guantanamo Bay NAS

Ident	NBW	**ATIS**	126.20
Elev	56	**Rwy/Length**	10/8000
Lat	N19°54'		28/8000
Long	W75°12'		

San Salvador, El Salvador – Ilopango Intl

Ident	SAL	**ATIS**	118.30
Elev	2021	**Rwy/Length**	15/7347
Lat	N13°41'		33/7347
Long	W89°07'		

Guatemala City, Guatemala – La Aurora Intl

Ident	GUA	**ATIS**	—
Elev	4952	**Rwy/Length**	01/9800
Lat	N14°34'		19/9800
Long	W90°31'		

Montego Bay, Jamaica – Sangster Intl

Ident	MBJ	**ATIS**	127.90
Elev	4	**Rwy/Length**	07/8705
Lat	N18°30'		25/8705
Long	W77°55'		

Ixtapa, Mexico – Ixtapa / Zihuatanejo

Ident	ZIH	**ATIS**	118.30
Elev	20	**Rwy/Length**	08/8202
Lat	N17°36'		26/8202
Long	W101°27'		

Mexico City, Mexico – Benito Juarez Intl

Ident	MEX	**ATIS**	127.70
Elev	7341	**Rwy/Length/ILS/ID**	05R/12795/109.10/IMWX
Lat	N19°26'		23L/12795/109.70/IMEX
Long	W99°04'		05L/12618
			23R/12618

San Jose, Mexico – Juan Santa Maria Intl

Ident	SJO	**ATIS**	—
Elev	3021	**Rwy/Length/ILS/ID**	07/9882/109.50/IOCO
Lat	N09°59'		25/9882
Long	W84°12'		

San Juan, Puerto Rico – Luis Munoz Marin Intl

Ident	SJU	**ATIS**	—
Elev	10	**Rwy/Length/ILS/ID**	08/10002/110.30/ISJU
Lat	N18°26'		26/10002
Long	W66°00'		10/8016/109.70/ICLA
			28/8016

VORs

Location/Name	Ident	Freq	Lat	Long
Antigua				
V C Bird	ANU	114.50	N17°07'	W61°47'
Aruba				
Aruba	ABA	112.50	N12°30'	W69°56'
Bahamas				
Bimini	ZBV	116.70	N25°42'	W79°17'
Eleuthera I	ZGV	112.50	N25°15'	W76°18'
Nassau	ZQA	112.70	N25°01'	W77°27'
Treasure Cay	ZTC	112.90	N26°44'	W77°22'
Barbados				
Adams	BGI	112.70	N13°04'	W59°29'
Belize				
Belize	BZE	114.30	N17°32'	W08°18'
Bermuda				
Bermuda	BDA	113.90	N32°21'	W64°41'
Cayman Islands				
France	FTD	109.00	N09°21'	W79°51'

Location/Name	Ident	Freq	Lat	Long
Cuba				
Manzanillo	UMZ	116.00	N20°18'	W77°06'
Navy Guantanamo Bay	NBW	114.60	N19°54'	W75°11'
Nuevas	UNV	116.30	N21°23'	W77°13'
Santiago De Cuba	UCU	113.30	N20°04'	W75°09'
Costa Rica				
El Coco	TIO	115.70	N09°59'	W84°14'
Liberia	LIB	112.80	N10°35'	W85°32'
Limon	LIO	116.30	N09°57'	W83°01'
Dominican Republic				
Cabo Rojo	CRO	114.30	N17°56'	W71°38'
Puerto Plata	PTA	115.10	N19°45'	W70°34'
Punta Cana	PNA	112.70	N18°33'	W68°21'
Punta Caucedo	CDO	114.70	N18°25'	W69°40'
El Salvador				
El Salvador	CAT	117.50	N13°26'	W89°02'
Ilopango	YSV	114.70	N13°41'	W89°07'
La Aurora	AUR	114.50	N14°35'	W90°31'
La Mesa	LMS	113.10	N15°28'	W87°54'
Guadeloupe				
Pointe A Pitre	PPR	115.10	N16°16'	W61°30'
Guatemala				
La Aurora	AUR	114.50	N14°35'	W90°31'
Rabinal	RAB	116.10	N15°00'	W90°28'
San Jose	SJO	114.10	N13°56'	W90°51'
Haiti				
Cap Haitien	HCN	113.90	N19°43'	W72°11'
Obleon	OBN	113.20	N18°26'	W72°16'
Port Au Prince	PAP	115.30	N18°34'	W72°18'
Jamacia				
Kingston	KIN	115.90	N17°58'	W16°53'
Montego Bay	MBJ	115.70	N18°29'	W77°55'
Martinique				
Fort De France	FOF	113.30	N14°35'	W60°59'

Location/Name	Ident	Freq	Lat	Long
Mexico				
Apan	APN	114.80	N19°38'	W98°23'
Chihuahua	CUU	114.10	N28°48'	W105°57'
Ciudad Juarez	CJS	116.70	N31°38'	W106°25'
Colima	COL	117.70	N19°16'	W103°34'
Cozumel	CZM	112.60	N20°28'	W86°57'
Cuautla	CUA	116.30	N18°47'	W98°54'
Del Norte	ADN	115.40	N25°51'	W100°14'
Del Norte	ADN	115.40	N25°51'	W100°14'
Guadalajara	GDL	117.30	N20°31'	W103°18'
Hermosillo	HMO	112.80	N29°05'	W111°02'
Lucia	SLM	116.60	N19°44'	W99°01'
Manzanillo	ZLO	116.80	N19°09'	W104°34'
Matamoros	MAM	114.30	N25°46'	W97°31'
Mateo	SMO	112.10	N19°33'	W99°13'
Merida	MID	117.70	N20°54'	W89°38'
Mexico City	MEX	115.60	N19°26'	W99°04'
Monterrey	MTY	114.70	N25°46'	W100°06'
Nautla	NAU	112.30	N20°11'	W96°44'
Nuevo Laredo	NLD	112.60	N27°26'	W99°33'
Otumba	OTU	115.00	N19°41'	W98°46'
Pachuca	PCA	112.70	N20°07'	W98°41'
Pasteje	PTJ	114.50	N19°38'	W99°47'
Poza Rica	PAZ	111.50	N20°36'	W97°28'
Puebla	PBC	115.20	N19°09'	W98°22'
Reynosa	REX	112.40	N26°00'	W98°13'
Tampico	TAM	117.50	N22°17'	W97°51'
Tequis	TEQ	113.10	N18°41'	W99°15'
Tijuana	TIJ	116.50	N32°32'	W116°57'
Toluca	TLC	114.30	N19°21'	W99°34'
Uruapan	UPN	114.20	N19°23'	W102°02'
Zihuatanejo	ZIH	113.80	N17°36'	W101°28'
Neth Antilles				
Curacao	PJG	116.70	N12°12'	W69°00'
St Maarten	PJM	113.00	N18°02'	W63°07'
Panama				
David	DAV	114.30	N08°23'	W82°26'
France	FTD	109.00	N09°21'	W79°51'
Santiago	STG	114.50	N08°05'	W80°56'
Taboga Island	TBG	110.00	N08°47'	W79°33'
Tocumen	TUM	117.10	N09°03'	W79°24'

Location/Name	Ident	Freq	Lat	Long
Puerto Rico				
Borinquen	BQN	113.50	N18°29'	W67°06'
Mayaguez	MAZ	110.60	N18°15'	W67°09'
Ponce	PSE	109.00	N17°59'	W66°31'
San Juan	SJU	114.00	N18°26'	W65°59'
Trinidad				
Piarco	POS	116.90	N10°27'	W61°23'
Turks Islands				
Grand Turk	GTK	114.20	N21°26'	W71°08'
Virgin Islands				
St Croix	COY	108.20	N17°44'	W64°42'
St Thomas	STT	108.60	N18°21'	W65°01'

NDBs

Location/Name	Ident	Freq	Lat	Long
Antigua				
V C Bird	ANU	351	N17°07'	W61°48'
V C Bird	ZDX	369	N17°09'	W61°46'
Belize				
Belize	BZE	392	N17°32'	W88°18'
Bahamas				
Bimini	ZBB	396	N25°42'	W79°16'
Freeport	ZFP	209	N26°31'	W78°46'
Freeport	BHF	326	N26°34'	W78°39'
Great Inagua	ZIN	376	N20°57'	W73°40'
Marsh Harbour	ZMH	361	N26°30'	W77°04'
Nassau	ZQA	251	N25°02'	W77°28'
Rock Sound	RSD	348	N24°53'	W76°10'
Stella Maris	ZLS	526	N23°34'	W75°15'
Treasure Cay	ZTC	233	N26°44'	W77°17'
West End	ZWE	317	N26°41'	W78°58'
Bermuda				
St Davids Head	BSD	323	N32°22'	W64°38'

Location/Name	Ident	Freq	Lat	Long
Caicos Islands				
Providenciales	PV	387	N21°46'	W72°15'
Cayman Islands				
Cayman Brac	CBC	415	N19°41'	W79°51'
Grand Cayman	ZIY	344	N19°17'	W81°22'
Costa Rica				
Barra Del Colorado	COL	380	N10°46'	W83°35'
Horcones	HOR	260	N09°57'	W84°17'
Limon	LIO	380	N09°58'	W83°01'
Parrita	PAR	395	N09°31'	W84°20'
Cuba				
Alegre	UPA	382	N22°22'	W78°46'
Baracoa	UBA	278	N20°22'	W71°34'
Gerona	UNG	412	N21°45'	W82°52'
Guantanamo	UGT	300	N20°04'	W74°57'
Manzanillo	UMZ	232	N20°16'	W77°10'
Mao	UMO	212	N20°38'	W74°31'
Nuevas	UNV	256	N21°24'	W77°13'
Simones	USR	315	N21°44'	W78°48'
Varder	UVR	272	N23°05'	W81°22'
Dominica				
Melville Hall	DOM	273	N15°32'	W61°17'
El Salvador				
Amate Campo	LAN	331	N13°24'	W89°08'
Ilopango	YSX	215	N13°42'	W89°07'
Guadeloupe				
Pointe A Pitre	AR	402	N16°17'	W61°37'
Pointe A Pitre	PPR	300	N16°15'	W61°31'
Guatemala				
Guatemala	TGE	375	N14°35'	W90°31'
Iztapa	IZP	400	N13°56'	W90°44'
Rabinal	RBN	313	N15°00'	W90°28'
Haiti				
Cap Haitien	HTN	288	N19°44'	W72°11'
Port Au Prince	HHP	270	N18°34'	W72°17'

Location/Name	Ident	Freq	Lat	Long
Honduras				
Tegucigalpa	TGU	355	N13°56'	W87°14'
Toncontin	TNT	405	N14°03'	W87°13'
Jamaica				
Kingston	KIN	360	N18°57'	W76°52'
Montego Bay	MBJ	248	N18°30'	W77°55'
Martinique				
Fort De France	FXF	314	N14°35'	W61°05'
Mexico				
Cozumel	CZM	330	N20°31'	W99°09'
Nautla	NAU	392	N20°12'	W86°55'
Plaza	MW	370	N19°23'	W96°44'
Santa Elena	SNE	260	N26°43'	W98°34'
Tepexpan	TPX	359	N19°36'	W98°57'
Tizayuca	TIZ	341	N19°52'	W98°59'
Tulancingo	TCG	308	N20°05'	W98°21'
Neth Antilles				
St Maarten	PJM	308	N18°02'	W63°07'
Puerto Rico				
Mayaguez	MAZ	254	N18°15'	W67°09'
Patty (Lom/Ndb)	SJ	330	N18°24'	W66°05'
Saint Croix				
Peste (Lom)	SX	241	N17°41'	W64°53'
Saint Vincent Islands				
E T Joshua	SV	403	N13°08'	W61°13'
San Andres				
San Andres	SPP	387	N12°34'	W81°41'
Trinidad				
Piarco	POS	382	N10°35'	W61°25'
Turks Islands				
Grand Turk	GT	232	N21°26'	W71°08'

EUROPE

Airports

Innsbruck, Austria – Innsbruck

Ident	LOWI	**ATIS**	—
Elev	1900	**Rwy/Length**	08/6562
Lat	N47°15'		26/6562
Long	E11°20'		

Saint Johann, Austria – Saint Johann

Ident	LOIJ	**ATIS**	—
Elev	2201	**Rwy**	13
Lat	N47°31'		31
Long	E12°27'		

Salsburg, Austria – Salsburg

Ident	LOWS	**ATIS**	—
Elev	1411	**Rwy/Length**	16/8366
Lat	N47°47'		34/8366
Long	E13°00'		

Scharding, Austria – Scharding

Ident	LOXX	**ATIS**	—
Elev	1073	**Rwy**	08
Lat	N48°24'		26
Long	E13°27'		

Vienna, Austria – Schwechat

Ident	VIE	**ATIS**	118.72
Elev	600	**Rwy/Length/ILS/ID**	12/9843/110.30/OEW
Lat	N48°07'		30/9843/109.70/OEX
Long	E16°34'		16/11811/108.50/OEZ
			34/11811/108.10/OEN

Zell Am See, Austria – Zell Am See

Ident	LOWZ	**ATIS**	—
Elev	2470	**Rwy/Length**	05/1873
Lat	N47°17'		23/1873
Long	E12°47'		

Santa Maria, Azores Islands – Santa Maria

Ident	SMA	**ATIS**	123.45
Elev	308	**Rwy/Length/ILS/ID**	18/10000/110.30/MA
Lat	N36°58'		36/10000/110.30/MA
Long	W25°10'		

Brussels, Belgium – Brussels National

Ident	BRU	**ATIS**	132.47
Elev	184	**Rwy/Length/ILS/ID**	02/9790/109.90/IBX
Lat	N50°54'		20/9790
Long	E4°29'		17L/11936
			25R/11936/108.90/IBR
			17R/10535
			25L/10535/110.30/IBL

Prague, Czech Republic – Ruzyne

Ident	PRG	**ATIS**	122.15
Elev	1247	**Rwy/Length/ILS/ID**	04/6955
Lat	N50°06'		22/6955
Long	E14°15'		06/12188
			24/12188/109.10/PR
			13/10663
			31/10663/109.50/PG

Copenhagen, Denmark – Kastrup

Ident	CPH	**ATIS**	122.85
Elev	17	**Rwy/Length/ILS/ID**	04L/9843/110.50/CH
Lat	N55°37'		22R/9843/110.90/IGLK
Long	E12°39'		04R/10827/109.30/NE
			22L/10827/109.50/OXS
			12/7759/109.90/KA
			30/7759/108.90/OY

Helsinki, Finland – Helsinki-Vantaa

Ident	HEL	**ATIS**	—
Elev	167	**Rwy/Length/ILS/ID**	04/11286/111.30/HG
Lat	N60°19'		22/11286/110.30/HK
Long	E24°58'		15/9514/109.10/HL
			33/9514

Amiens, France – Glisy

Ident	LFAY	**ATIS**	—
Elev	197	**Rwy/Length**	12/4134
Lat	N49°52'		30/4134
Long	E2°23'		12/2953 Grass
			30/2953 Grass

Beauvais, France – Tille

Ident	LFOB	**ATIS**	—
Elev	358	**Rwy/Length**	13/7972
Lat	N49°27'		31/7972
Long	E2°06'		05/3625
			23/3625
			13/2838 Grass
			31/2838 Grass

Bretigny-sur-Orge, France – Bretigny-sur-Orge

Ident	—	**ATIS**	—
Elev	269	**Rwy/Length/ILS/ID**	05//108.9/BY
Lat	N48°35'		
Long	E02°19'		

Cambrai, France – Niergnies

Ident	LFYG	**ATIS**	—
Elev	312	**Rwy/Length**	02/2231 Grass
Lat	N50°08'		20/2231 Grass
Long	E3°15'		08/2953
			26/2953
			15/7874
			33/7874

Chateaudun, France – Chateaudun

Ident	LFOC	**ATIS**	
Elev	433	**Rwy/Length**	10/7546
Lat	N48°03'		28/7546
Long	E1°22'		

Deauville, France – St Gatien

Ident	LFRG	**ATIS**	—
Elev	479	**Rwy/Length**	12/8366
Lat	N49°21'		30/8366
Long	E00°09'		12/2297 Grass
			30/2297 Grass

Joigny, France – Joigny

Ident	LFGK	**ATIS**	—
Elev	728	**Rwy/Length**	08/3510
Lat	N47°59'		26/3510
Long	E3°23'		08/2297 Grass
			26/2297 Grass

Le Havre, France – Octeville

Ident	LFOH	**ATIS**	—
Elev	312	**Rwy/Length**	05/7546
Lat	N49°32'		23/7546
Long	E00°05'		11/2461 Grass
			29/2461 Grass

Le Mans, France – Arnage

Ident	LFRM	**ATIS**	—
Elev	194	**Rwy/Length**	02/4626
Lat	N47°57'		20/4626
Long	E00°12'		

Melun, France – Villaroche

Ident	—	**ATIS**	128.17
Elev	302	**Rwy/Length/ILS/ID**	29//110.5/MV
Lat	N48°36'		
Long	E02°40'		

Paris, France – Les Mureaux

Ident	—	**ATIS**	—
Elev	89	**Rwy/Length**	—
Lat	N48°59'		
Long	E01°56'		

Paris, France – Orly

Ident	LFPO	**ATIS**	126.50
Elev	292	**Rwy/Length/ILS/ID**	02L/7874/110.30/OLN
Lat	N48°43'		20R/7875
Long	E02°22'		07/11975/108.50/ORE
			25/11975/110.90/OLO
			08/10892/108.15/OLE
			26/10892/109.50/OLW
			06/1640 Grass
			24/1640 Grass

Paris, France – Charles DeGaulle

Ident	LFPG	**ATIS**	128.0
Elev	387	**Rwy/Length/ILS/ID**	09/11811/110.10/CGE
Lat	N49°01'		27/11811/110.70/CGW
Long	E02°32'		10/11860/108.70/GLE
			28/11860/109.10/GAU

Paris, France – Le Bourget

Ident	LFPB	**ATIS**	120.0
Elev	217	**Rwy/Length/ILS/ID**	03/8743
Lat	N48°58'		21/8743
Long	E02°26'		07/9843/109.90/LBE
			25/9843/111.10/LBW
			27//110.55/RGE

Peroone-St Quentin, France – Peroone-St Quentin

Ident	LFAG	**ATIS**	—
Elev	292	**Rwy/Length**	09/8005
Lat	N49°52'		27/8005
Long	E3°01'		

Persan-Beaumont, France – Persan-Beaumont

Ident	LFPA	**ATIS**	—
Elev	148	**Rwy/Length**	10L/2723
Lat	N49°10'		28R/2723
Long	E02°18'		10R/2887
			28L/2887

Pontoise, France – Cormeilles-en-Vexin

Ident	LFPT	**ATIS**	121.2
Elev	325	**Rwy/Length/ILS/ID**	05/5545/108.1/CVN
Lat	N49°05'		23/5545
Long	E02°02'		12/5413
			30/5413

Reims, France – Champagne

Ident	LFST	**ATIS**	—
Elev	312	**Rwy/Length**	07/8143
Lat	N49°18'		25/8143
Long	E4°03'		

Rouen, France – Boox

Ident	LFOP	**ATIS**	—
Elev	512	**Rwy/Length**	04/5577
Lat	N49°23'		22/5577
Long	E1°11'		

St Andre De L'Eure, France – St Andre De L'Eure

Ident	LFFD	**ATIS**	—
Elev	492	**Rwy**	06
Lat	N48°54'		24
Long	E1°15'		

Toussus-Le-Nouble, France – Toussus-Le-Nouble

Ident	LFPN	**ATIS**	127.47
Elev	538	**Rwy/Length**	07L/3609
Lat	N48°45'		25R/3609/109.3/TNO
Long	E02°06'		07R/3445
			25L/3445

Troyes, France – Barberey

Ident	LFQB	**ATIS**	—
Elev	394	**Rwy/Length/ILS/ID**	05/2854
Lat	N48°19'		23/2854
Long	E04°01'		18/5413/111.9/TY
			36/5413

Villacoublay, France – Velizy AB

Ident	—	**ATIS**	—
Elev	581	**Rwy/Length**	—
Lat	N48°46'		
Long	E02°12'		

Aalen-Heidenhaim, Germany – Elchingen

Ident	EDTA	**ATIS**	—
Elev	1916	**Rwy/Length**	09L/3281
Lat	N48°46'		27R/3281
Long	E10°16'		09R/2625 Grass
			27L/2625 Grass

Arnbruck, Germany – Arnbruck

Ident	EDYB	**ATIS**	—
Elev	1716	**Rwy/Length**	17/2001
Lat	N49°07'		35/2001
Long	E12°59'		

Augsburg, Germany – Augsburg

Ident	EDMA	**ATIS**	118.22
Elev	1515	**Rwy/Length**	07/4199
Lat	N48°25'		25/4199
Long	E10°56'		

Berlin, Germany – Tegel

Ident	—	**ATIS**	125.9
Elev	121	**Rwy/Length/ILS/ID**	26R//110.1/ITLW
Lat	N52°33'		26L//109.3/ITGW
Long	E13°17'		08L//109.1/ITLE
			08R//108.5/ITGE

Berlin, Germany – Tempelhof

Ident	—	**ATIS**	126.02
Elev	164	**Rwy/Length/ILS/ID**	09R//109.7/IDBR
Lat	N52°28'		27L//109.5/IDLB
Long	E13°24'		

Deggendorf, Germany – Deggendorf

Ident	EDMW	**ATIS**	—
Elev	1030	**Rwy/Length**	09/1903
Lat	N48°49'		27/1903
Long	E12°52'		

Donauwoerth, Germany – Donauwoerth-Genderkingen

Ident	EDMQ	**ATIS**	—
Elev	1312	**Rwy/Length**	09/1739
Lat	N48°42'		27/1739
Long	E10°51'		

Eggenfelden, Germany – Eggenfelden

Ident	EDME	**ATIS**	—
Elev	1342	**Rwy/Length**	09/2920
Lat	N48°23'		27/2920
Long	E12°43'		

Giengen/Brenz, Germany – Giengen/Brenz

Ident	EDGI	**ATIS**	—
Elev	1695	**Rwy/Length**	17/1804
Lat	N48°38'		35/1804
Long	E10°13'		

Gunzenhausen, Germany – Reutberg

Ident	EDMH	**ATIS**	—
Elev	1591	**Rwy/Length**	06/2379
Lat	N49°06'		24/2379
Long	E10°47'		

Hamburg, Germany – Hamburg

Ident	EHAM	**ATIS**	—
Elev	53	**Rwy/Length/ILS/ID**	05/10663/110.50/IHB
Lat	N53°37'		23/10663/111.50/DLH
Long	E9°59'		15/12028/111.10/IAM
			33/12028

Jesenwang, Germany – Jesenwang

Ident	EDMJ	**ATIS**	—
Elev	1861	**Rwy/Length**	07/1460
Lat	N48°10'		25/1460
Long	E11°07'		

Landshut, Germany – Landshut

Ident	EDML	**ATIS**	—
Elev	1312	**Rwy/Length**	07/2953
Lat	N48°30'		25/2953
Long	E12°02'		

Leutkirch, Germany – Unterzeil

Ident	EDYL	**ATIS**	—
Elev	2099	**Rwy/Length**	06/3346
Lat	N47°51'		24/3346
Long	E10°00'		

Mindelheim, Germany – Mattsies

Ident	EDMN	**ATIS**	—
Elev	1857	**Rwy/Length**	15/2067
Lat	N48°06'		33/2067
Long	E10°31'		

Muhldorf, Germany – Muhldorf

Ident	EDMY	**ATIS**	—
Elev	1325	**Rwy/Length**	08/1969
Lat	N48°16'		26/1969
Long	E12°30'		

Munich, Germany – Munich

Ident	EDDM	**ATIS**	118.37
Elev	1486	**Rwy/Length/ILS/ID**	08L/13123/110.30/IMNE
Lat	N48°21'		26R/13123/108.70/IMNW
Long	E11°47'		08R/13123/110.90/IMSE
			26L/13123/108.30/IMSW

Nordlingen, Germany – Nordlingen

Ident	EDNO	**ATIS**	—
Elev	1384	**Rwy/Length**	04/1640
Lat	N48°52'		22/1640
Long	E10°30'		

Oberpfaffenhofen, Germany – Oberpfaffenhofen

Ident	EDMO	**ATIS**	—
Elev	1946	**Rwy/Length**	04/7500
Lat	N48°04'		22/7500
Long	E11°17'		

Regensburg, Germany – Oberhub

Ident	EDYR	**ATIS**	—
Elev	1298	**Rwy/Length**	10/2234
Lat	N49°08'		28/2234
Long	E12°05'		

Straubing, Germany – Wallmuhle

Ident	EDMS	**ATIS**	—
Elev	1046	**Rwy/Length**	10/3478
Lat	N48°54'		28/3478
Long	E12°31'		

Vilshofen, Germany – Vilshoven

Ident	EDMV	**ATIS**	—
Elev	991	**Rwy/Length**	12/3281
Lat	N48°38'		30/3281
Long	E13°11'		

Vogtareuth, Germany – Vogtareuth

Ident	EDYV	**ATIS**	—
Elev	1535	**Rwy/Length**	06/1535
Lat	N47°56'		24/1535
Long	E12°12'		

Athens, Greece – Athens

Ident	ATH	**ATIS**	123.40
Elev	68	**Rwy/Length/ILS/ID**	15L/11483
Lat	N37°53'		33R/11483/110.30/IATH
Long	E23°43'		15R/10335
			33L/10335

Keflavik, Iceland – Keflavik

Ident	KEF	**ATIS**	118.30
Elev	171	**Rwy/Length/ILS/ID**	02/10000
Lat	N63°59'		20/10000/110.30/IKO
Long	W22°36'		07/6942
			25/6942
			11/10013/109.50/IKF
			29/10013

Dublin, Ireland – Dublin

Ident	DUB	**ATIS**	124.52
Elev	242	**Rwy/Length/ILS/ID**	10/8652/108.90/IDE
Lat	N53°25'		28/8652/108.90/IDW
Long	W6°15'		11/4450
			29/4450
			16/6800/111.50/IAC
			34/6800

Rome, Italy – Ciampino

Ident	—	**ATIS**	—
Elev	426	**Rwy/Length/ILS/ID**	15//109.9/CIA
Lat	N47°54'		
Long	E12°35'		

Rome, Italy – Fiumicino

Ident	FCO	**ATIS**	121.7
Elev	14	**Rwy/Length/ILS/ID**	07/10810
Lat	N41°48'		25/10810/109.70/FEE
Long	E12°15'		16L/12795/108.10/FLL
			34R/12795/109.30/FSS
			16R/12795/110.30/FRR
			34L/12795/108.90/ISW

Rome, Italy – Urbe

Ident	—	**ATIS**	—
Elev	55	**Rwy/Length**	—
Lat	N41°57'		
Long	E12°30'		

Bergen, Norway – Flesland

Ident	BGO	**ATIS**	125.25
Elev	165	**Rwy/Length/ILS/ID**	18/8038/109.90/BR
Lat	N60°17'		36/8038/110.50/BG
Long	E5°13'		

Warsaw, Poland – Okecie

Ident	WAW	**ATIS**	118.30
Elev	362	**Rwy/Length/ILS/ID**	11/9186
Lat	N52°10'		29/9186
Long	E20°58'		15/12106
			33/12106/110.30/WA

Lisbon, Portugal – Lisbon

Ident	LIS	**ATIS**	118.10
Elev	374	**Rwy/Length/ILS/ID**	03/12484/109.10/LI
Lat	N38°46'		21/12484/109.50/LB
Long	W9°08'		17/7874
			35/7874

Glasgow, Scotland – Glasgow

Ident	GLA	**ATIS**	118.80
Elev	26	**Rwy/Length/ILS/ID**	05/8720/110.10/IUU
Lat	N55°52'		23/8720/110.10/IOO
Long	E4°25'		10/3570
			26/3570

Barcelona, Spain – Barcelona

Ident	BCN	**ATIS**	118.65
Elev	10	**Rwy/Length/ILS/ID**	02/8924
Lat	N41°17'		20/8924
Long	E2°04'		07/10197/110.30/QAA
			25/10197/109.50/BCA

Madrid, Spain – Barajas

Ident	MAD	**ATIS**	118.25
Elev	1998	**Rwy/Length/ILS/ID**	18/12139
Lat	N40°28'		36/12139/110.30/BJS
Long	E3°33'		15/13451
			33/13451/109.90/MAA

Stockholm, Sweden – Skavsta

Ident	SKN	**ATIS**	127.70
Elev	140	**Rwy/Length/ILS/ID**	09/7802/111.30/WEK
Lat	N58°47'		27/7802/111.90/EKN
Long	E16°54'		16/6637
			34/6637

Geneva, Switzerland – Cointrin

Ident	GUA	**ATIS**	125.72
Elev	1411	**Rwy/Length/ILS/ID**	05/12795/110.90/INE
Lat	N46°14'		23/12795/109.90/ISW
Long	W6°06'		05/2700 Grass
			23/2700 Grass

Andrewsfield, UK. – Andrewsfield

Ident	—	**ATIS**	127.17
Elev	286	**Rwy**	09
Lat	N51°53'		27
Long	E00°27'		

Biggin Hill, UK. – Biggin Hill

Ident	EGKB	**ATIS**	—
Elev	600	**Rwy/Length/ILS/ID**	03/5932
Lat	N51°19'		21/5932/109.35/IBGH
Long	E00°02'		11/2677
			29/2677

Blackbushe, UK. – Blackbushe

Ident	EGLK	**ATIS**	—
Elev	329	**Rwy/Length**	08/4403
Lat	N51°19'		26/4403
Long	W00°50'		08/1640 Grass
			26/1640 Grass

Denham, UK. – Denham

Ident		**ATIS**	133.07
Elev	249	**Rwy/Length**	6/2556
Lat	N51°35'		24/2556
Long	W00°30'		12/1850 Grass
			30/1850 Grass

Dunsfold, UK. – Dunsfold

Ident	—	**ATIS**	128.47
Elev	172	**Rwy/Length**	7/6221
Lat	N51°07'		25/6221
Long	W00°32'		

Elstree, UK. – Elstree

Ident	EGTR	**ATIS**	—
Elev	334	**Rwy/Length**	08/2152
Lat	N51°39'		26/2152
Long	W00°19'		

Fairoaks, UK. – Fairoaks

Ident	EGTF	**ATIS**	—
Elev	80	**Rwy/Length**	06/2625
Lat	N51°20'		24/2625
Long	W00°33'		

Farnborough, UK. – Farnborough

Ident	EGLF	**ATIS**	—
Elev	237	**Rwy/Length**	07/7874
Lat	N51°16'		25/7874
Long	W00°46'		11/4494
			29/4494
			18/4205
			36/4205

Halton AB, UK. – Halton AB

Ident	—	**ATIS**	120.57
Elev	370	**Rwy/Length**	02/3707 Grass
Lat	N51°47'		20/3707 Grass
Long	W00°44'		08/2710 Grass
			26/2710 Grass

Hatfield, UK. -(CLOSED)

Ident	—	**ATIS**	120.57
Elev	254	**Rwy**	24
Lat	N51°45'		
Long	W00°15'		

Leavesden, UK. – (CLOSED)

Ident	—	**ATIS**	133.07
Elev	335	**Rwy**	24
Lat	N51°41'		
Long	W00°25'		

London, UK. – Gatwick

Ident	EGKK	**ATIS**	128.47
Elev	196	**Rwy/Length/ILS/ID**	08R/10364/110.90/IGG
Lat	N51°09'		26L/10364/110.90/IWW
Long	W00°11'		08L/8415
			26R/8415

London, UK. – Heathrow

Ident	EGLL	**ATIS**	123.9
Elev	80	**Rwy/Length/ILS/ID**	09R/12000/109.50/IBB
Lat	N51°28'		27L/12000/109.50/ILL
Long	W00°27'		09L/12802/110.30/IAA
			27R/12802/110.30/IRR
			23/6450

London, UK. – London City

Ident	EGLC	**ATIS**	—
Elev	17	**Rwy/Length/ILS/ID**	10/3934/111.15/LST
Lat	N51°30'		28/3934/111.15/LSR
Long	E00°03'		

London, UK. – Luton

Ident	—	**ATIS**	120.57
Elev	526	**Rwy/ILS/ID**	08//109.15/ILTN
Lat	N51°52'		26//109.15/ILJ
Long	E00°22'		

London, UK. – Stansted

Ident	EGSS	**ATIS**	127.17
Elev	347	**Rwy/Length/ILS/ID**	05/10000/110.50/ISED
Lat	N51°53'		23/10000/110.50/ISX
Long	E00°14'		08/7087/109.15/ILTN
			26/7087/109.15/ILJ

Northolt, UK. – Northolt AB

Ident	EGWU	**ATIS**	—
Elev	124	**Rwy/Length**	07/5525
Lat	N51°33'		25/5525
Long	W00°25'		

North Weald, UK. – North Weald

Ident		**ATIS**	127.17
Elev	321	**Rwy/Length**	2/6332
Lat	N51°43'		20/6332
Long	E00°09'		13/3005
			31/3005

Panshanger, UK. – Panshanger

Ident	—	**ATIS**	120.57
Elev	250	**Rwy/Length**	11/2362 Grass
Lat	N51°48'		29/2362 Grass
Long	W00°09'		

Redhill, UK. – Redhill

Ident	—	**ATIS**	128.47
Elev	221	**Rwy/Length**	8R/2943 Grass
Lat	N51°12'		26L/2943 Grass
Long	W00°08'		8L/2224 Grass
			26R/2224 Grass
			01/2789 Grass
			19/2789 Grass

Stapleford, UK. – Stapleford

Ident	EGSG	**ATIS**	—
Elev	185	**Rwy/Length**	04/3533 Grass
Lat	N51°39'		22/3533 Grass
Long	E00°09'		10/2346 Grass
			28/2346 Grass

White Waltham, UK. – White Waltham

Ident	—	**ATIS**	133.07
Elev	130	**Rwy/Length**	07/3642 Grass
Lat	N51°30'		25/3642 Grass
Long	W00°46'		03/3363 Grass
			21/3363 Grass
			11/3051 Grass
			29/3051 Grass

Wycombe Air Park (Booker), UK. – Wycombe Air Park

Ident	—	**ATIS**	133.07
Elev	520	**Rwy/Length**	07/2411
Lat	N51°36'		25/2411
Long	W00°48'		07/2001 Grass
			25/2001 Grass
			17/2582 Grass
			35/2582 Grass

VORs

Location/Name	Ident	Freq	Lat	Long
Austria				
Eurach	EUR	115.20	N47°44'	E11°15'
Fischamend	FMD	110.40	N48°06'	E16°37'
Kempten	KPT	109.60	N47°44'	E10°21'
Linz	LNZ	116.60	N48°13'	E14°06'
Munich	MUN	112.30	N48°10'	E11°49'
Roding	RDG	114.70	N49°02'	E12°31'
Salzburg	SBG	113.80	N48°00'	E12°53'
Souenau	SNU	115.50	N47°52'	E16°17'
Stockerau	STO	113.00	N48°25'	E16°01'
Villach	VIW	112.90	N46°41'	E13°54'
Wagram	WGM	112.20	N48°19'	E16°29'
Belgium				
Affligem	AFI	114.90	N50°54'	E4°08'
Bruno	BUN	110.60	N51°04'	E4°46'
Brussels	BUB	114.60	N50°54'	E4°32'
Chievers	CIV	113.20	N50°34'	E3°50'
Chievers	CIV	113.20	N50°34'	E3°49'
Costa	COA	111.80	N51°20'	E3°21'
Diekirch	DIK	114.40	N49°51'	E6°07'
Belgium (continued)				
Haamstede	HSD	115.50	N51°43'	E3°51'
Huldenberg	HUL	117.55	N50°45'	E4°38'
Koksy	KOK	114.50	N51°05'	E2°39'
Koksy	KOK	114.50	N51°06'	E2°39'
Luxembourg	DIK	114.40	N49°51'	E6°07'
Nicky	NIK	117.40	N51°10'	E4°11'
Olno	LNO	112.80	N50°35'	E5°42'
Spirmont	SPI	113.10	N50°30'	E5°37'
Czech Republic				
Cheb	OKG	115.70	N50°03'	E12°24'
Hermsdorf	HDO	115.00	N50°55'	E14°22'
Neratovice	NER	108.60	N50°18'	E14°23'
Prague	OKL	112.60	N50°06'	E14°13'
Roudnice	RCE	117.60	N50°27'	E14°12'
Vlasim	VLM	114.30	N49°42'	E15°04'
Vozice	VOZ	116.30	N49°32'	E14°52'
Denmark				
Alma	ALM	116.40	N55°24'	E13°33'
Astor	AOR	113.90	N56°07'	E12°57'
Codan	CDA	114.90	N55°00'	E12°22'
Kastrup	KAS	112.50	N55°35'	E12°36'
Korsa	KOR	112.80	N55°26'	E11°38'
Nora	NOA	112.60	N56°06'	E12°14'
Odin	ODN	115.50	N55°34'	E10°39'
Sevda	SVD	116.20	N56°10'	E12°34'
Sturup	SUP	113.00	N55°32'	E13°22'
Trano	TNO	117.40	N55°46'	E11°26'
Finland				
Anton	ANT	113.70	N60°51'	E25°07'
Helsinki	HEL	114.20	N60°20'	E24°57'
Utti	UTT	114.60	N60°53'	E26°56'
Vihti	VTI	117.00	N60°27'	E24°14'
France				
Abberville	ABB	116.60	N50°08'	E1°51'
Amboise	AMB	113.70	N47°25'	E1°03'
Angers	ANG	113.00	N47°32'	W00°51'
Beauvais	BVS	115.90	N49°26'	E2°09'

Location/Name	Ident	Freq	Lat	Long
France (continued)				
Boursonne	BSN	112.50	N49°11'	E3°03'
Bray	BRY	114.10	N48°24'	E3°17'
Caen	CAN	115.40	N49°10'	W00°27'
Cambrai	CMB	112.60	N50°13'	E3°09'
Charles-De-Gaulle (Paris)	CGN	115.35	N49°01'	E2°30'
Charles-De-Gaulle (Paris)	PGS	117.05	N49°00'	E2°37'
Chartres	CHW	115.20	N48°28'	E00°59'
Chateaudun	CDN	116.10	N48°03'	E1°23'
Chatillon	CTL	117.60	N49°08'	E3°34'
Coulommiers	CLM	112.90	N48°50'	E3°00'
Creil	CRL	109.20	N49°15'	E2°31'
Deauville	DVL	110.20	N49°18'	E00°18'
Dieppe	DPE	115.80	N49°55'	E1°10'
Dijion	DIJ	113.50	N47°16'	E5°05'
Dijion	DIJ	113.50	N47°16'	E5°05'
Epernon	EPR	115.65	N48°37'	E1°39'
Evreux	EVX	112.40	N49°01'	E1°13'
L'aigle	LGL	115.00	N48°47'	E00°32'
Le Bourget (Paris)	BT	108.80	N48°58'	E2°27'
Melun	MEL	109.80	N48°27'	E2°48'
Montdidier	MTD	113.65	N49°33'	E2°29'
Moulins	MOU	116.70	N46°42'	E3°38'
Nevers	NEV	113.40	N47°09'	E2°55'
Orly (Paris)	OL	111.20	N48°43'	E2°23'
Pithiviers	PTV	116.50	N48°09'	E2°15'
Pontoise	PON	111.60	N49°05'	E2°02'
Rambouillet	RBT	114.70	N48°39'	E1°59'
Reims	REM	112.30	N49°18'	E4°02'
Rolampont	RLP	117.30	N47°54'	E5°15'
Rouen	ROU	116.80	N49°27'	E1°16'
Toussus	TSU	108.25	N48°45'	E2°06'
Troyes	TRO	116.00	N48°15'	E3°57'
Germany				
Allersberg	ALB	111.20	N49°12'	E11°13'
Alsie	ALS	114.70	N54°54'	E9°59'
Alster	ALF	115.80	N53°38'	E9°59'
Ausburg	AUG	115.90	N48°25'	E10°56'
Brunkendorf	BKD	117.70	N53°02'	E11°32'
Dinkelsbuhl	DKB	117.80	N49°08'	E10°14'
Elbe	LBE	115.10	N52°39'	E9°35'
Erding	ERD	113.60	N48°19'	E11°57'
Erlangen	ERL	114.90	N49°39'	E11°09'

Location/Name	Ident	Freq	Lat	Long
Germany (continued)				
Eurach	EUR	115.20	N47°44'	E11°15'
Hamburg	HAM	113.10	N53°41'	E10°12'
Hehlingen	HLZ	117.30	N52°21'	E10°47'
Helgoland	DHE	116.30	N54°11'	E7°54'
Karlspuhe	KRH	115.95	N48°59'	E8°35'
Kempten	KPT	109.60	N47°44'	E10°21'
Klagenfurt	KFT	113.10	N46°35'	E14°33'
Leine	DLE	115.20	N52°15'	E9°53'
Lubeck	LUB	110.60	N53°56'	E10°40'
Luburg	LBU	109.20	N48°54'	E9°20'
Maisach	MAH	108.40	N48°15'	E11°18'
Michaelsdorf	MIC	112.10	N54°18'	E11°00'
Milldorf	MDF	117.00	N48°14'	E12°20'
Moosburg	MBG	117.15	N48°34'	E12°15'
Munich	MUN	112.30	N48°10'	E11°49'
Munich	DMN	116.00	N48°22'	E11°47'
Munich	DMS	108.60	N48°20'	E11°46'
Nienburg	NIE	116.50	N52°37'	E9°22'
Roding	RDG	114.70	N49°02'	E12°31'
Tango	TGO	112.50	N48°37'	E9°15'
Tranasdingen	TRA	114.30	N47°41'	E8°26'
Villach	VIW	112.90	N46°41'	E13°54'
Walda	WLD	112.80	N48°34'	E11°07'
Warburg	WRB	113.70	N51°30'	E9°06'
Weser	WSR	112.90	N53°21'	E8°52'
Wurzburg	WUR	116.35	N49°43'	E9°56'
Zurich	ZUE	110.50	N47°35'	E8°49'
Greece				
Athens	ATH	114.40	N37°54'	E23°43'
Didimon	DDM	117.20	N37°28'	E23°13'
Kea	KEA	115.00	N37°33'	E24°18'
Milos	MIL	113.50	N36°44'	E24°31'
Tripolis	TRL	116.20	N37°24'	E22°20'
Hungary				
Gyor	GYR	115.10	N47°39'	E17°43'
Iceland				
Ingo	ING	112.40	N63°48'	W16°38'
Keflavik	KEF	112.00	N63°59'	W2°36'

Location/Name	Ident	Freq	Lat	Long
Ireland				
Baldonnel	BAL	115.80	N53°18'	W6°26'
Connaught	CON	117.40	N53°54'	W8°49'
Dublin	DUB	114.90	N53°30'	W6°18'
Isle Of Man	IOM	112.20	N54°04'	W4°45'
Shannon	SHA	113.30	N52°43'	W8°53'
Italy				
Ajaccio	AJO	114.80	N41°46'	E8°46'
Alghero	ALG	113.80	N40°27'	E8°14'
Bastia	BTA	114.15	N42°34'	E9°28'
Bolsena	BOL	114.40	N42°37'	E12°02'
Campagnano	CMP	111.40	N42°07'	E12°22'
Carbonara	CAR	115.10	N39°06'	E9°30'
Elba	ELB	114.70	N42°43'	E10°23'
Ostia	OST	114.90	N41°48'	E12°14'
Pescara	PES	115.90	N42°26'	E14°11'
Pisa	PIS	112.10	N43°40'	E10°23'
Ponza	PNZ	114.60	N40°54'	E12°57'
Sorrento	SOR	112.20	N40°34'	E14°20'
Tarquinia	TAQ	111.80	N42°12'	E11°44'
Teano	TEA	112.90	N41°17'	E13°58'
Norway				
Flesland	FLE	114.50	N60°18'	E5°12'
Vollo	VOO	114.85	N60°32'	E5°07'
Poland				
Karnice	KRN	117.80	N51°56'	E20°26'
Lodz	LDZ	112.40	N51°48'	E19°39'
Piaseczno	PNO	112.90	N52°03'	E21°03'
Siedlce	SIE	114.70	N52°09'	E22°12'
Warsaw	OKE	113.40	N52°10'	E20°57'
Zaborowek	WAR	114.90	N52°15'	E20°39'
Portugal				
Beja	BEJ	115.80	N38°07'	W7°55'
Espichel	ESP	112.50	N38°25'	W9°11'
Fatima	FTM	113.50	N39°39'	W8°29'
Lisbon	LIS	114.80	N38°53'	W9°09'
Sintra	SRA	112.10	N38°49'	W9°20'

Location/Name	Ident	Freq	Lat	Long
Spain				
Bagur	BGR	112.20	N41°56'	E3°12'
Barahona	BAN	112.80	N41°19'	W2°37'
Barcelona	QUV	114.30	N41°17'	E2°05'
Campo Real	CPL	114.50	N40°19'	W3°22'
Castejon	CJN	115.60	N40°22'	W2°32'
Colmenar Viejo	CNR	117.30	N40°38'	W3°44'
Domingo	DGO	112.60	N42°27'	W2°52'
Maella	MLA	112.10	N41°07'	E00°10'
Reus	RES	114.20	N41°09'	E1°10'
Toledo	TLD	113.20	N39°58'	W4°20'
Torrejon	TJZ	115.10	N40°28'	W3°28'
Villatobas	VTB	112.70	N39°46'	W3°27'
Sweden				
Mantor	MNT	114.00	N58°23'	E15°17'
Trosa	TRS	114.30	N58°56'	E17°30'
Switzerland				
Chambery	CBY	115.40	N45°53'	E5°45'
Epinal	EPL	113.00	N48°19'	E6°03'
Fribourg	FRI	110.85	N46°46'	E7°13'
Geneva	GVA	114.60	N46°15'	E6°08'
Hochwald	HOC	113.20	N47°28'	E7°40'
Martigues	MTG	117.30	N43°23'	E5°05'
Nice	NIZ	112.40	N43°46'	E7°15'
Passeiry	PAS	116.60	N46°09'	E6°00'
Rolampont	RLP	117.30	N47°54'	E5°15'
Saronno	SRN	113.70	N45°38'	E9°01'
Satolas	LSA	114.75	N45°43'	E5°05'
St Prex	SPR	113.90	N46°28'	E6°26'
Tour Du Pin	TDP	110.60	N45°29'	E5°26'
United Kingdom				
Barkway	BKY	116.25	N51°59'	E00°03'
Biggin	BIG	115.10	N51°19'	E00°02'
Blackbushe	BLC	116.20	N51°19'	W00°50'
Boulogne	BNE	113.80	N50°37'	E1°54'
Bovingdon	BNN	113.75	N51°43'	W00°32'
Brookmans Park	BPK	117.50	N51°44'	W00°06'
Burnham	BUR	117.10	N51°31'	W00°40'
Clacton	CLN	114.55	N51°50'	E1°09'
Compton	CPT	114.35	N51°29'	W1°13'

Location/Name	Ident	Freq	Lat	Long
United Kingdom (continued)				
Daventry	DTY	116.40	N52°10'	W1°06'
Deancross	DCS	115.20	N54°43'	W3°20'
Fairoaks	FRK	109.85	N51°20'	W00°33'
Glasgow	GOW	115.40	N55°52'	W4°26'
Lambourne	LAM	115.60	N51°38'	E00°09'
London	LON	113.60	N51°29'	W00°27'
Lydd	LYD	114.05	N50°59'	E00°52'
Manchester	MCT	113.55	N53°21'	W2°15'
Mayfield	MAY	117.90	N51°00'	E00°07'
Midhurst	MID	114.00	N51°03'	W00°37'
Ockham	OCK	115.30	N51°18'	W00°26'
Odiham	ODH	109.60	N51°13'	W00°56'
Perth	PTH	110.40	N56°26'	W3°22'
Pole Hill	POL	112.10	N53°44'	W2°06'
Saint Abbs	SAB	112.50	N55°54'	W2°12'
Seaford	SFD	117.00	N50°45'	E00°07'
Southampton	SAM	113.35	N50°57'	W1°20'
Talla	TLA	113.80	N55°30'	W3°21'
Turnberry	TRN	117.50	N55°18'	W4°47'

NDBs

Location/Name	Ident	Freq	Lat	Long
Austria				
Absam	AB	313	N47°17'	E11°30'
Bruck	BRK	408	N48°03'	E16°43'
Innsbruck	INN	420	N47°13'	E11°24'
Kuhtai	KTI	413	N47°10'	E11°01'
Rattenberg	RTT	303	N47°25'	E11°56'
Salzburg	SBG	382	N47°58'	E12°53'
Salzburg	SI	410	N47°49'	E12°59'
Salzburg	SU	356	N47°52'	E12°57'
Steinhof	STE	293	N48°12'	E16°14'
Vienna	WO	303	N48°08'	E16°27'
Belgium				
Bressy	BUS	283.5	N50°41'	E4°08'
Bruno	BUN	341.5	N51°04'	E4°46'
Brussels	OB	293	N50°55'	E4°37'
Brussels	OP	402	N50°56'	E4°35'
Brussels	OZ	314	N50°49'	E4°28'
Belgium (continued)				
Dender	DEN	393	N50°52'	E4°01'
Diekirch	DIK	307	N49°51'	E6°07'
Klien Brogel	ONT	431	N51°12'	E5°33'
Nicky	NIK	336	N51°09'	E4°11'
Czech Republic				
Rakovnik	RAK	386	N50°05'	E13°41'
Ruzyne Middle	PG	307	N50°02'	E14°22'
Ruzyne North	PR	356	N50°08'	E14°22'
Finland				
Espoo	ESP	381	N60°14'	E24°48'
Foxtrot	F	408	N60°16'	E25°02'
Heka	HEK	344	N60°15'	E25°29'
Hyvinkaa	HYV	396	N60°33'	E24°43'
Korso	KOR	322	N60°22'	E25°04'
Pakka	PAK	368	N60°42'	E25°32'
France				
Alencon	AL	380	N48°27'	E00°06'
Amiens	GI	339	N49°50'	E2°29'
Beauvais	BV	391	N49°29'	E2°01'
Bray	BRY	277	N48°24'	E3°17'
Charles-De-Gaulle (Paris)	CGO	343	N48°59'	E2°24'
Charles-De-Gaulle (Paris)	CGZ	370	N49°00'	E2°44'
Charles-De-Gaulle (Paris)	RSO	364	N49°00'	E2°21'
Charles-De-Gaulle (Paris)	RSY	356	N49°01'	E2°42'
Chateaudun	CDN	359.5	N48°03'	E1°21'
Compiegne	CO	553.5	N49°26'	E2°48'
Etampes	EM	295.5	N48°22'	E2°04'
Le Bourget (Paris)	BGW	334	N48°56'	E2°16'
Le Havre	LHO	346	N49°35'	E00°11'
Le Mans	LM	326	N47°53'	E00°10'
Melun	MV	434	N48°33'	E2°58'
Orleans	OAN	385	N48°00'	E1°46'
Orly (Paris)	OLS	328	N48°38'	E2°20'
Orly (Paris)	ORW	402	N48°40'	E2°11'
Orly (Paris)	OYE	349	N48°45'	E2°32'
Peronne-St. Quentin	PM	382	N49°52'	E3°08'
Troyes	TY	320	N48°24'	E4°00'
Villacoublay	TA	286.5	N48°46'	E2°05'
Villacoublay	TH	302	N48°46'	E2°22'
Villacoublay	HOL	315	N48°43'	E1°49'

Location/Name	Ident	Freq	Lat	Long
Germany				
Ansbach	ANS	452	N49°18'	E10°37'
Augsburg	AGB	318	N48°25'	E10°56'
Gluckstadt	GLX	365	N53°51'	E9°27'
Hamburg	FU	350.5	N53°34'	E9°52'
Hamburg	HAM	339	N53°40'	E10°05'
Hamburg	GT	323	N53°40'	E10°05'
Hofenfels	HFX	286	N49°13'	E11°51'
Ingolstadt	IGL	345	N48°44'	E11°38'
Landsberg	LQ	448	N48°05'	E11°02'
Mengen	MEG	401	N48°03'	E9°22'
Mike	MIQ	426.5	N48°34'	E11°36'
Munich	MNE	358	N48°21'	E11°40'
Munich	MNW	338	N48°22'	E11°54'
Munich	MSE	385	N48°20'	E11°39'
Munich	MSW	400	N48°21'	E11°54'
Nordlingen	NDG	375	N48°49'	E10°25'
Oberpfaffenhofen	OBI	429	N48°04'	E11°17'
Greece				
Aigina	EGN	382	N37°45'	E23°25'
Athens	HN	294	N37°52'	E23°44'
Athens	HK	275	N37°49'	E23°46'
Elefsis	ELF	418	N38°04'	E23°46'
Karistos	KRS	285	N38°00'	E24°25'
Kavouri	KVR	357	N37°48'	E23°45'
Korinthos	KOR	392	N37°56'	E22°56'
Sounion	SUN	319	N37°40'	E24°02'
Tangra	TNG	303	N38°20'	E23°43'
Hungary				
Pusztasabolcs	PTB	386	N47°08'	E18°45'
Gyor	GYR	354	N47°39'	E17°43'
Iceland				
Ellidavain	EL	335	N64°04'	W21°46'
Keflavik	KF	392	N63°59'	W22°36'
Kilo	OK	364	N64°03'	W22°36'
Reyjavik	RK	355	N64°09'	W22°01'
Skagi	SA	379	N64°18'	W21°58'
Skardsfjara	SR	312.6	N63°31'	W17°58'
Vestmannaey Jar	VM	375	N63°24'	W20°17'

Location/Name	Ident	Freq	Lat	Long
Ireland				
Clonmel	CML	387	N52°27'	W7°28'
Dublin	OE	316	N53°25'	W6°25'
Dublin	OP	397	N53°24'	W6°08'
Garristown	GAR	407	N53°31'	W6°26'
Killiney	KLY	378	N53°16'	W6°06'
Rush	RSH	326	N53°30'	W6°06'
Italy				
Alghero	ALG	382	N40°35'	E8°15'
Ciampino	CMP	412	N41°51'	E12°33'
Fiumicino	FN	421	N41°54'	E12°14'
Fiumicino	FW	345	N41°52'	E12°11'
Fiumicino	FE	354	N41°49'	E12°21'
Frosinone	FRS	371	N41°38'	E13°17'
Ostia	OST	321	N41°48'	E12°14'
Pratica Di Mara	PRA	339	N41°40'	E12°27'
Urbe	URB	285	N41°56'	E12°29'
Norway				
Omastrand	OMA	326	N60°13'	E5°59'
Vollo	VOL	391	N60°32'	E5°06'
Poland				
Przysucha	TMS	488	N51°21'	E22°38'
Warsaw	WAG	336	N52°12'	E20°48'
Warsaw	W	361	N52°08'	E20°59'
Warsaw	WAO	412	N52°05'	E21°01'
Warsaw	WAG	375	N52°10'	E20°56'
Spain				
Alcobendas	ACD	417	N40°35'	W3°40'
Arbacon	ARN	291	N40°57'	W3°07'
Barajas	MA	390	N40°24'	W3°29'
Barajas	BJ	308	N40°26'	W3°33'
Barajas	RS	326	N40°23'	W3°33'
Barajas	MD	369	N40°33'	W3°33'
Barcelona	QA	338	N41°16'	E1°59'
Getafe	GE	421	N40°12'	W3°50'
Lerida	LRD	404	N41°33'	E00°39'
Navas Del Rey	NVS	432	N40°22'	W4°14'

Location/Name	Ident	Freq	Lat	Long
Spain (continued)				
Sabadell	SBD	367	N41°31'	E2°06'
Somosierra	SMA	350	N41°08'	W3°34'
Torralba De Aragon	TRL	335	N41°56'	W00°30'
Villanueva	VNV	380	N41°12'	E1°42'
Sweden				
Skavasta	PEO	398	N58°47'	E17°02'
Skavasta	NW	364	N58°47'	E16°47'
Switzerland				
Gland	GLA	320	N46°24'	E6°14'
United Kingdom				
Blackbushe	BLK	328	N51°19'	W00°50'
Chiltern	CHT	277	N51°37'	W00°31'
Cumbernauld	CBN	374	N55°58'	W3°58'
Epsom	EPM	316	N51°19'	W00°22'
Fairoaks	FOS	348	N51°20'	W00°33'
Gatwick (London)	GY	365	N51°07'	W00°18'
Gatwick (London)	GE	338	N51°09'	W00°04'
Glasgow	AC	325	N55°48'	W4°32'
Glasgow	GLG	350	N55°55'	W4°20'
Heathrow (London)	OW	389	N51°27'	W00°34'
Heathrow (London)	OE	389	N51°27'	W00°20'
Henton	HEN	395	N51°45'	W00°47'
London City	LCY	322	N51°30'	E00°04'
Luton	LUT	345	N51°53'	W00°14'
Redhill	RDL	343	N51°12'	W00°08'
Stansted (London)	SAN	359	N51°56'	E00°18'
Westcott	WCO	335	N51°51'	W00°57'
Woodley	WOD	352	N51°27'	W00°52'

MIDDLE EAST

Airports

Jerusalem, Israel – Jerusalem

Ident	—	**ATIS**	—
Elev	2485	**Rwy/Length/ILS/ID**	30//111.9/IR
Lat	N31°51'		
Long	E35°13'		

Tel Aviv, Israel – Ben Gurion Intl

Ident	TLV	**ATIS**	132.50
Elev	135	**Rwy/Length/ILS/ID**	03/5840
Lat	N32°00'		21/5840
Long	E34°52'		08/11998
			26/11998/108.70/BA
			12/10210/110.30/BG
			30/10210

Amman, Jordan – Queen Alia Intl

Ident	—	**ATIS**	127.6
Elev	2395	**Rwy/Length/ILS/ID**	26L//110.9/IQA
Lat	N31°43'		08L//109.3/IQAN
Long	E35°59'		

Kuwait, Kuwait – Kuwait Intl

Ident	KWI	**ATIS**	118.30
Elev	210	**Rwy/Length/ILS/ID**	15L/11483/110.10/IKIC
Lat	N29°13'		33R/11483/110.50/IKID
Long	E47°58'		15R/11155
			33L/11155/109.50/IKIA

Riyadh, Saudi Arabia – King Khalid Intl

Ident	RUH	**ATIS**	118.60
Elev	2082	**Rwy/Length/ILS/ID**	15L/13780/109.5/IELF
Lat	N24°57'		33R/13780/109.10/IKIA
Long	E46°42'		15R/13780/110.50/ITIH
			33L/13780/110.10/IFAT

Istanbul, Turkey – Ataturk

Ident	IST	**ATIS**	128.20
Elev	158	**Rwy/Length/ILS/ID**	06/7546/110.30/IIST
Lat	N40°58'		24/7546/110.30/IIST
Long	E28°49'		18/9843/111.10/IISB
			36/9843/108.10/IYES

Aden, Yemen – Aden International

Ident	ADE	**ATIS**	118..70
Elev	12	**Rwy/Length**	8/10171
Lat	N12°49'		26/10171
Long	E45°01'		

VORs

Location/Name	Ident	Freq	Lat	Long
Israel				
Bengurion	BGN	115.40	N32°00'	E34°52'
Metzada	MZD	115.00	N31°19'	E35°23'
Natania	NAT	112.40	N32°20'	E34°58'
Kuwait				
Kuwait	KUA	115.50	N29°13'	E47°58'
Ras Al Mishab	RAS	116.40	N28°04'	E48°36'
Wafra	KFR	112.00	N28°37'	E47°57'
Saudi Arabia				
Al Ahsa	HSA	116.60	N25°16'	E49°29'
Al Kharj	AKJ	117.30	N24°04'	E47°24'
King Khalid	KIA	113.30	N24°53'	E46°45'
Magala	MGA	116.30	N26°13'	E47°16'
Riyadh	RIY	114.50	N24°43'	E46°43'
Thumamah	TIH	113.80	N25°09'	E46°33'
Turkey				
Beykoz	BKZ	117.30	N41°07'	E29°08'
Istanbul	IST	112.50	N40°58'	E28°48'
Tekirdag	EKI	116.30	N40°57'	E27°25'
Yalova	YAA	117.70	N40°34'	E29°22'
Yemen				
Aden	KRA	112.50	N12°49'	E45°01'
Taiz	TAZ	113.60	N13°42'	E44°08'

NDBs

Location/Name	Ident	Freq	Lat	Long
Israel				
Jerusalem	IRM	366	N31°51'	E35°12'
Tel Aviv	LL	331	N32°03'	E34°46'
Kuwait				
Kuwait	WR	368	N29°18'	E47°55'
Turkey				
Cekmece	CEK	328	N41°00'	E28°31'
Istanbul	ST	340	N41°03'	E28°48'
Istanbul	IS	396	N41°03'	E28°48'
Toakapi	TOP	370	N41°00'	E28°59'
Yemen				
Aden	KRY	400	N12°49'	E45°°02'
Aden	AD	361	N12°52'	E45°°00'

PACIFIC OCEAN

Airports

Alice Springs, Australia – Alice Springs

Ident	ASP	**ATIS**	118.30
Elev	1789	**Rwy/Length/ILS/ID**	06/3376
Lat	S23°48'		24/3376
Long	E133°53'		12/7999/109.90/IAS
			30/7999
			17/3717
			35/3717

Brisbane, Australia – Brisbane

Ident	BNE	**ATIS**	125.50
Elev	13	**Rwy/Length/ILS/ID**	01/11680/109.50/IBA
Lat	S27°25'		19/11680/110.10/IBS
Long	E153°05'		14/5577
			32/5577

Darwin, Australia – Darwin

Ident	DRW	**ATIS**	133.10
Elev	103	**Rwy/Length/ILS/ID**	11/10906
Lat	S12°25'		29/10906/109.70/IDN
Long	E130°52'		18/5000
			36/5000

Melbourne, Australia – International

Ident	MEB	**ATIS**	114.10/132.70
Elev	434	**Rwy/Length/ILS/ID**	16/11998/109.70
Lat			34/11998
Long			09/7500
			27/7500/109.30/IMW

Perth, Australia – Perth Intl

Ident	PER	**ATIS**	123.80
Elev	67	**Rwy/Length/ILS/ID**	03/11299
Lat	S31°56'		21/11299/109.50/IGD
Long	E115°58'		06/7096
			24/7096
			11/5233
			29/5233

Sydney, Australia – Kingsford Smith

Ident	SYD	**ATIS**	127.60
Elev	21	**Rwy/Length/ILS/ID**	07/8301/109.90/ISY
Lat	S33°56'		25/8301
Long	E151°10'		16R/12999/109.50/IKS
			34L/12999/110.10/ISN
			16L/12999/110.9/ISS
			34R/12999/109.3/IKN

Christmas Island, Christmas Island – Christmas Island

Ident	XCH	**ATIS**	—
Elev	916	**Rwy/Length**	18/6900
Lat	S10°27'		36/6900
Long	E105°41'		

Nadi, Fiji – Nadi Intl

Ident	NAN	**ATIS**	119.10
Elev	57	**Rwy/Length/ILS/ID**	02/10499/109.90/INN
Lat	S17°45'		20/10499
Long	E177°26'		09/6998
			27/6998

Guam, Guam – Agana NAS

Ident	NGM	**ATIS**	118.10
Elev	297	**Rwy/Length/ILS/ID**	06R/8001
Lat	N13°28'		24L/8001
Long	E144°47'		06L/10014/110.30/IGUM
			24R/10014

Johnston Atoll, Johnston Atoll – Johnston Atoll

Ident	JON	**ATIS**	122.80
Elev	7	**Rwy/Length**	05/9000
Lat	N16°43'		23/9000
Long	W169°32'		

Midway Island, Midway Island – Midway NAF

Ident	MDY	**ATIS**	126.20
Elev	13	**Rwy/Length**	06/7900
Lat	N28°11'		24/7900
Long	W177°23'		

Auckland, New Zealand – Auckland Intl

Ident	AKL	**ATIS**	127.80
Elev	23	**Rwy/Length/ILS/ID**	05/11926/110.30/IAA
Lat	S37°00'		23/11926/109.90/IMG
Long	E174°47'		

Queenstown, New Zealand – Queenstown

Ident	ZQN	**ATIS**	118.10
Elev	1171	**Rwy/Length**	05/4000
Lat	S45°01'		23/4000
Long	E168°44'		14/3097 Grass
			32/3097 Grass

Wellington, New Zealand – Wellington Intl

Ident	WLG	**ATIS**	126.90
Elev	40	**Rwy/Length/ILS/ID**	16/6348/110.30/IEB
Lat	S41°19'		34/6348/109.90/IMP
Long	E174°48'		

Port Moresby, Papua New Guinea – Jackson's Intl

Ident	POM	**ATIS**	128.00
Elev	126	**Rwy/Length/ILS/ID**	14R/6798
Lat	S09°26'		32L/6798
Long	E147°13'		14L/9022/110.10/IWG
			32R/9022/109.50/IBB

Wake Island, Wake Island – Wake Island

Ident	AWK	**ATIS**	128.00
Elev	14	**Rwy/Length**	10/9859
Lat	N19°16'		28/9859
Long	E166°38'		

VORs

Location/Name	Ident	Freq	Lat	Long
Australia				
Alice Springs	AS	115.90	S23°47'	E133°52'
Avalon	AV	116.10	S38°03'	E144°27'
Ballidu	BIU	114.30	S30°35'	E116°46'
Bindook	BIK	116.80	S34°10'	E150°06'
Brisbane	BN	113.20	S27°22'	E153°08'
Christmas Island	XMX	112.40	S10°25'	E105°41'
Coolangatta	CG	112.30	S28°10'	E153°30'
Cowes	CWS	117.60	S38°30'	E145°12'
Darwin	DN	112.40	S12°24'	E130°51'
Darwin	DAR	113.70	S12°24'	E130°52'
Eildon Weir	ELW	112.30	S37°12'	E145°50'
Fentons Hill	FTH	115.30	S37°30'	E144°48'
Jacobs Well	JCW	116.50	S27°45'	E153°20'
Laravale	LAV	117.80	S28°05'	E152°55'
Maroochydore	MC	114.20	S26°36'	E153°05'
Melbourne	ML	114.10	S37°39'	E144°50'
Mt Mcquoid	MQD	117.30	S33°06'	E151°08'
Perth	PH	113.70	S31°56'	E115°57'
Sydney	SY	115.40	S33°56'	E151°10'
Tennant Creek	TNK	112.90	S19°38'	E134°10'
West Maitland	WMD	114.60	S32°45'	E151°31'
Wonthaggi	WON	115.90	S38°28'	E145°37'
Yarrowee	YWE	114.30	S37°44'	E143°45'
Fiji Island				
Nadi	NN	112.50	S17°39'	E177°23'
Nausori	NA	112.20	S18°02'	E178°33'
Guam				
Nimitz	UNZ	115.30	N13°27'	E144°43'
Johnston Island				
Johnston Island	JON	111.80	N16°44'	W169°32'
New Zealand				
Auckland	AA	114.80	S37°00'	E174°48'
Hamilton	HN	113.30	S37°51'	E175°19'
Invercargill	NV	112.90	S46°24'	E168°19'
Palmerston North	PM	113.40	S40°19'	E175°36'
Slope Hill	SH	113.60	S44°59'	E168°47'
Tory	TR	114.60	S41°11'	E174°21'
Wellington	WN	112.30	S41°20'	E174°49'
Whenuapai	WP	108.80	S36°47'	E174°37'
Papua New Guinea				
Girua	GUA	116.50	S08°44'	E148°15'
Port Moresby	PY	117.00	S09°27'	E147°12'
Wake Island				
Wake Island	AWK	113.50	N19°17'	E166°37'

NDBs

Location/Name	Ident	Freq	Lat	Long
Australia				
Alice Springs	AS	335	S23°47'	E133°52'
Amberley	AMB	359	S27°39'	E152°43'
Archerfield	AF	419	S27°34'	E153°00'
Bagot	BGT	308	S12°24'	E130°51'
Bolinda	BOL	362	S37°27'	E144°47'
Brisbane	BN	302	S27°24'	E153°05'
Calga	CAA	392	S33°24'	E151°10'
Caversham	CVM	329	S31°52'	E115°58'
Christmas Island	XMX	341	S10°25'	E105°41'
Cuderdin	CUN	293	S31°37'	E117°13'
Darwin	DN	344	S12°26'	E130°57'
East Lakes	ETL	218	S33°56'	E151°12'
Epping	EPP	377	S37°40'	E145°01'
Essendon	EN	356	S37°43'	E144°54'
Glenfield	GLF	317	S33°59'	E150°58'
Guildford	GFD	272	S31°56'	E115°56'
Howard Springs	HWS	257	S12°26'	E131°02'
Kilcoy	KCY	392	S26°55'	E152°34'
Meadow	MEA	230	S37°39'	E144°53'
Parkerville	PRL	352	S31°51'	E116°06'
Pearce	PEA	340	S31°39'	E116°01'
Perth	PH	400	S32°01'	E115°48'
Pingeuy	PIY	233	S32°32'	E117°04'
Plenty	PLE	218	S37°43'	E145°06'
Redland Bay	RLB	218	S27°37'	E153°18'
Rockdale	ROC	338	S37°35'	E144°49'
Simpsons Gap	SPG	362	S23°43'	E133°44'
Singleton	SGT	290	S32°33'	E151°15'
Temple Bar	TPB	352	S23°44'	E133°47'
Wallaby	WAY	372	S23°52'	E134°01'
West Pymble	WPB	254	S33°46'	E151°07'
Fiji Island				
Malolo	AL	385	S17°49'	E177°23'
Momi	MI	364	S17°54'	E177°19'
Nadi	NN	290	S17°47'	E177°25'
Navakai	VK	405	S17°47'	E177°25'
Navua	NV	281	S18°14'	E178°10'
Guam				
Mt Macajna	AJA	385	N13°27'	E144°44'
Saipan	SN	312	N15°06'	E145°42'
Johnston Island				
Apollo	APO	388	N16°43'	W169°32'
New Zealand				
Alexandra	LX	386	S45°10'	E169°28'
Auckland	AA	374	S37°01'	E174°45'
Cape Campbell	CC	286	S41°44'	E174°16'
Newlands	NL	358	S41°13'	E174°49'
Queenstown	QN	362	S45°01'	E168°44'
Surrey	SY	350	S37°14'	E175°10'
Titahi Bay	TY	234	S41°07'	E174°49'
Waiuku	WI	254	S37°16'	E174°48'
Wellington	WN	298	S41°20'	E174°48'
Westpoint	OT	398	S37°03'	E174°36'
Whitford	HD	334	S36°57'	E175°00'
Papua New Guinea				
Girua	GUA	224	S08°44'	E148°15'
Jackson	JSN	380	S09°22'	E147°10'
Kubuna	KUB	1662	S08°41'	E146°45'
Parer	PRE	395	S09°19'	E147°08'
Port Moresby	PY	368	S09°27'	E147°13'
Tavai	TVI	350	S09°43'	E147°28'

SOUTH AMERICA

Airports

Buenos Aires, Argentina – Ezeiza Intl

Ident	EZE	**ATIS**	119.10
Elev	66	**Rwy/Length/ILS/ID**	11/10827/110.10/PC
Lat	S34°49'		29/10827
Long	W58°32'		17/9203
			35/9203/108.70/EZ
			05/7215
			23/7215

Ascension Island, Ascension Island – Ascension Aux AB

Ident	ASI	**ATIS**	—
Elev	273	**Rwy/Length**	14/10000
Lat	S07°58'		32/10000
Long	W14°23'		

La Paz, Bolivia – Kennedy Intl

Ident	LPB	**ATIS**	118.30
Elev	13313	**Rwy/Length/ILS/ID**	09R/13124/110.30/ILP
Lat	S16°30'		27L/13124
Long	W68°10'		09L/7480
			27R/7480
			04/6365
			22/6365

Brasilia, Brazil – Brazilia Intl

Ident	BSB	**ATIS**	127.80
Elev	3473	**Rwy/Length/ILS/ID**	11/10499/110.30/IBR
Lat	S15°51'		29/10499
Long	W47°54'		

Natal, Brazil – August Severo

Ident	NAT	**ATIS**	118.70
Elev	169	**Rwy/Length**	12/5988
Lat	S05°54'		30/5988
Long	W35°14'		16R/5906
			34L/5906
			16L/7448
			34R/7448

Rio De Janeiro, Brazil – Rio De Janeiro Intl. Galeao

Ident	GIG	**ATIS**	127.60
Elev	30	**Rwy/Length/ILS/ID**	10/13123/109.30/ITB
Lat	S22°48'		28/13123/111.50/ILM
Long	W43°15'		15/10433/110.30/IGL
			33/10433

Rio De Janeiro, Brazil – Santa Cruz AB

Ident	—	**ATIS**	—
Elev	10	**Rwy/Length**	—
Lat	S22°55'		
Long	W43°43'		

Rio De Janeiro, Brazil – Santos Dumont

Ident	—	**ATIS**	127.6
Elev	11	**Rwy/Length/ILS/ID**	20L//111.1/IRJ
Lat	S22°54'		
Long	W43°09'		

Isla De Pascua, Chile – Mateveri Intl.

Ident	—	**ATIS**	—
Elev	227	**Rwy/Length/ILS/ID**	10//110.3/IIPA
Lat	S27°09'		
Long	W109°25'		

Santiago, Chile – Arthur Merino Benite

Ident	SCL	**ATIS**	132.10
Elev	1554	**Rwy/Length/ILS/ID**	17/10499/110.30/IUEL
Lat	S33°23'		35/10499
Long	W70°47'		

Santafe De Bogata, Columbia – Eldorado Intl

Ident	BOG	**ATIS**	118.10
Elev	8355	**Rwy/Length/ILS/ID**	12/12467/109.90/IEDR
Lat	N04°42'		30/12467
Long	W74°08'		12/3423
			30/3423

Quito, Ecuador – Mariscal Sucre Intl

Ident	UIO	**ATIS**	118.10
Elev	9223	**Rwy/Length/ILS/ID**	17/10236/110.50
Lat	S00°08'		35/10236/110.50/IQO
Long	W78°29'		

Cayenne, French Guiana – Rochambeau

Ident	CAY	**ATIS**	118.10
Elev	26	**Rwy/Length/ILS/ID**	08/10499/110.30/CA
Lat	N04°49'		26/10499
Long	W52°21'		

Asuncion, Paraguay – Silvio Pettirossi

Ident	ASU	**ATIS**	118.10
Elev	292	**Rwy/Length/ILS/ID**	2/11001
Lat	S25°14'		20/11001/109.50/IPST
Long	W57°31'		

Lima, Peru – Jorge Chavez Intl

Ident	LIM	**ATIS**	118.10
Elev	112	**Rwy/Length/ILS/ID**	15/11506/109.70/IJCH
Lat	S12°01'		33/11506
Long	W77°07'		

VORs

Location/Name	Ident	Freq	Lat	Long
Argentina				
Ezeiza	EZE	116.50	S34°49'	W58°32'
General Belgrando	GBE	115.60	S35°45'	W58°27'
La Plata	PTA	113.70	S34°58'	W57°53'
Lobos	BOS	114.60	S35°12'	W59°08'
Moriano Moreno	ENO	112.90	S34°33'	W58°47'
San Fernando	FDO	114.40	S34°27'	W58°35'
Ascension Island				
Ascension Aux	ASI	112.20	S07°58'	W14°23'
Azores				
Lajes	LM	112.30	N38°47'	W27°06'
Lajes	LAJ	110.80	N38°42'	W27°07'
Santa Maria	VSM	113.70	N36°57'	W25°10'
Bolivia				
Arica	ARI	116.50	S18°21'	W70°20'
Cochabamba	CBA	112.10	S17°25'	W66°10'
La Paz	PAZ	115.70	S16°30'	W68°13'
San Borja	BOR	117.50	S14°55'	W66°44'
Brazil				
Anapolis	ANP	115.40	S16°15'	W48°59'
Brasilia	BRS	115.90	S15°52'	W48°01'
Caxias	CAX	113.00	S22°46'	W43°20'
Goiania	GOI	112.70	S16°37'	W49°12'
Marica	MRC	114.00	S22°58'	W42°53'
Mossoro	MSS	112.40	S05°11'	W37°21'
Natal	NTL	114.30	S05°54'	W35°14'

Location/Name	Ident	Freq	Lat	Long
Brazil (continued)				
Pirai	PAI	115.00	S22°27'	W43°50'
Porto	PCX	114.60	S22°42'	W42°51'
Santa Cruz	SCR	113.60	S22°57'	W43°43'
Chile				
Los Cerrillos	SCL	112.30	S33°29'	W70°42'
Quintero	ERO	113.30	S32°47'	W71°30'
Santiago	AMB	116.10	S33°25'	W70°47'
Santo Domingo	SNO	113.70	S33°39'	W71°36'
Tabon	TBN	113.90	S32°55'	W70°50'
Columbia				
Bogota	BOG	114.70	N04°50'	W74°19'
Girardot	GIR	117.30	N04°11'	W74°52'
Mariquita	MQU	116.10	N05°12'	W74°55'
Villavicencio	VVC	116.70	N04°04'	W73°23'
Ecuador				
Ambato	AMV	112.70	S01°16'	W78°32'
Condorcocha	QIT	115.30	S00°02'	W78°30'
Ipiales	IPI	113.60	N00°51'	W77°40'
Monjas Sur	QMS	115.00	S00°13'	W78°28'
French Guiana				
Rochambeau	CYR	115.10	N04°48'	W52°22'
Parauay				
Asuncion	VAS	115.90	S25°08'	W57°29'
Formosa	FSA	115.60	S26°12'	W58°13'
Peru				
Asia	ASI	115.00	S12°45'	W76°36'
Chimbote	BTE	112.50	S09°08'	W78°31'
Lima	LIM	114.50	S12°00'	W77°07'
Pisco	SCO	114.10	S13°44'	W76°12'
Salinas	SLS	114.70	S11°17'	W77°34'

NDBs

Location/Name	Ident	Freq	Lat	Long
Argentina				
Ezeiza	OC	330	S34°48'	W58°37'
Ezeiza	OA	270	S34°53'	W58°30'
Ascension Island				
Ascension Island	ASN	360	S07°56'	W14°24'
Azores				
Ponta Delgada	MGL	371	N37°44'	W25°35'
Ponta Delgada	PD	351	N37°44'	W25°40'
Santa Maria	SMA	323	N36°59'	W25°10'
Santa Maria	STA	240	N36°56'	W25°10'
Boliva				
Charana	CHA	310	S17°35'	W69°26'
Coroico	CRC	305	S16°11'	W67°43'
La Paz	R	330	S16°30'	W68°13'
La Paz	LPZ	350	S16°29'	W68°11'
Brazil				
Afonsos	AFS	270	S22°52'	W43°22'
Brasilia	BRS	340	S15°52'	W48°01'
Campina Grande	CPG	230	S07°16'	W35°53'
Caxias	CAX	400	S22°45'	W43°20'
Cocho	CH	240	S15°51'	W47°53'
Formosa	FRM	210	S15°33'	W47°21'
Ilha	YLA	330	S22°47'	W43°10'
Joao Pessoa	JPS	320	S07°08'	W34°57'
Luziania	LUZ	400	S16°15'	W47°57'
Meriti	IT	290	S22°49'	W43°21'
Mossoro	MSS	275	S05°11'	W37°21'
Natal	NTL	400	S05°54'	W35°14'
Nova	NOA	215	S22°43'	W43°28'
Oiapoque	OIA	340	N03°51'	W51°48'
Paiol	PP	415	S22°52'	W43°09'
Rasa	IH	315	S23°03'	W43°08'
Chile				
Casablanca	CAS	328	S33°18'	W71°23'
Huechun	HUN	250	S33°02'	W70°48'
Lo Castro	CAS	220	S33°18'	W70°47'
Quintero	ERO	384	S32°44'	W71°29'
Tabon	TBN	288	S32°55'	W70°48'
Columbia				
Ambalema	ABL	300	N04°47'	W74°46'
Bogota	BOG	388	N04°50'	W74°19'
Bogota	ED	244	N04°46'	W74°13'
El Paso	EPO	225	N04°30'	N075°30'
Romeo	R	274	N04°40'	W74°06'
Techo	TEH	284	N04°38'	W74°09'
Zipaquira	ZIP	294	N05°01'	W74°01'
Equador				
Ascazubi	ZUI	290	S00°04'	W78°17'
Olmedo	OLM	400	N00°10'	W78°03'
Quito	UIO	350	S00°10'	W78°28'
French Guiana				
Rochambeau	FXC	327	N04°49'	W52°21'
St Laurent Du Maroni	CW	283	N05°28'	W54°01'
Paraguay				
Asuncion	ASU	360	S25°14'	W57°30'
Asuncion	VB	350	S25°16'	W57°31'
Asuncion	ST	340	S25°08'	W57°29'
Paraguari	PRI	350	S25°36'	W57°08'
Peru				
Las Palmas	LP	300	S12°13'	W77°01'
Lima-Callao	CH	248	S11°59'	W77°07'
Oyon	YON	360	S10°39'	W76°46'
Ventanilla	JC	375	S11°55'	W77°08'

UNITED STATES

Alabama

Airports

Huntsville, AL – Madison County

Ident	HSV	**ATIS**	121.25
Elev	630	**Rwy/Length/ILS/ID**	18R/8000/109.30/IHSV
Lat	N34°38'		36L/8000/108.50/IELL
Long	W86°46'		18L/10000/111.90/ITVN
			36R/10000

Montgomery, AL – Dannelly Field

Ident	MGM	**ATIS**	124.42
Elev	221	**Rwy/Length/ILS/ID**	03/4010
Lat	N32°17'		21/4010
Long	W86°23'		10/9001/109.90/IMGM
			28/9001/108.50/IDLV

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Andalusia	VOR	UIA	110.20	N31°18'	W86°23'	0
Brookley	VORTAC	BFM	112.80	N30°36'	W88°03'	10
Brookwood	VORTAC	OKW	111.00	N33°14'	W87°15'	649
Cahaba	VOR	CAQ	114.90	N32°20'	W86°59'	160
Cairns	VOR	OZR	111.20	N31°16'	W85°43'	300
Decatur	VOR-DME	DCU	112.80	N34°38'	W86°56'	590
Enterprise	VOR	EDN	116.60	N31°17'	W85°54'	369
Eufaula	VORTAC	EUF	109.20	N31°57'	W85°07'	280
Gadsden	VOR-DME	GAD	112.30	N33°58'	W86°05'	586
Hamilton	VORTAC	HAB	110.40	N34°11'	W88°00'	810
Hanchey	VOR	HEY	110.60	N31°22'	W85°39'	300
Monroeville	VORTAC	MVC	116.80	N31°27'	W87°21'	417
Montgomery	VORTAC	MGM	112.10	N32°13'	W86°19'	270
Muscle Shoals	VORTAC	MSL	116.50	N34°42'	W87°29'	580
Rocket	VORTAC	RQZ	112.20	N34°47'	W86°38'	1200
Semmes	VORTAC	SJI	115.30	N30°43'	W88°21'	190
Talladega	VOR-DME	TDG	108.80	N33°34'	W86°02'	530
Troy	VOR	TOI	110.00	N31°51'	W86°00'	400
Tuscaloosa	VORTAC	TCL	117.80	N33°15'	W87°32'	370
Tuskegee	VOR-DME	TGE	117.30	N32°29'	W85°40'	490
Vulcan	VORTAC	VUZ	114.40	N33°40'	W86°53'	750
Wiregrass	VORTAC	RRS	111.60	N31°17'	W85°25'	360

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Alexander City	DER	382	N32°52'	W85°57'	641
Bessemer	BEQ	368	N33°18'	W86°55'	660
Blood (LOM/NDB)	TO	365	N31°49'	W86°06'	500
Bogga (LOM)	AN	211	N33°32'	W85°55'	579
Boll Weevil	BVG	308	N31°20'	W85°58'	—
Brantley	XBR	410	N31°33'	W86°17'	—
Calera	AOA	215	N33°07'	W86°46'	610
Capshaw	CWH	350	N34°46'	W86°46'	—
Choctaw	BCZ	228	N32°06'	W88°07'	115
Cole Spring	CPP	230	N34°22'	W86°49'	830
Fayette	FDF	204	N33°42'	W87°48'	359
Fort Payne	FTP	426	N34°31'	W85°40'	900
Gragg-Wade	GGY	338	N32°51'	W86°36'	590
Greensboro	EOG	417	N32°36'	W87°39'	160
Hanchey	HYE	221	N31°22'	W85°38'	300
Judd	JUY	264	N31°18'	W86°23'	330
Lowe	LOR	269	N31°21'	W85°44'	—
Marengo	RZO	391	N32°24'	W88°00'	109
Marra (LOM)	MG	245	N32°18'	W86°30'	—
Opole (LOM)	AU	423	N32°30'	W85°26'	515
Persimmon	PRN	359	N31°51'	W86°36'	625
Polik (LOM/NDB)	SE	344	N32°16'	W86°55'	225
Redstone	HUA	287	N34°41'	W86°41'	—
Roeby (LOM)	RO	394	N33°36'	W86°40'	838
Ruckr (LOM/NDB)	OZ	212	N31°13'	W85°48'	—
Saratoga	ARF	296	N34°15'	W86°13'	1049
Spring Hill	XNE	281	N31°41'	W85°58'	495
Summerdale	ESU	204	N30°29'	W87°43'	60
Sylacauga	SCD	284	N33°10'	W86°19'	670
Tuske (LOM)	TC	362	N33°09'	W87°40'	—
Wilcox Co	IWE	350	N31°58'	W87°20'	141
Wisle (LOM/NDB)	MO	248	N30°45'	W88°18'	—

Alaska

Airports

Anchorage, AK – Anchorage Intl

Ident	ANC	**ATIS**	118.40
Elev	144	**Rwy/Length/ILS/ID**	14/10496
Lat	N61°10'		32/10496
Long	W149°59'		6L/10600/109.90/ITGN
			24R/10600
			6R/10897/111.30/IANC
			24L/10897

Barrow, AK – Wiley Post-Will Rodgers Mem

Ident	PBI	**ATIS**	123.60
Elev	44	**Rwy/Length/ILS/ID**	06/6500/109.10/IBRW
Lat	N71°17'		24/6500
Long	W156°45'		

Fairbanks, AK – Fairbanks Intl

Ident	FAI	**ATIS**	124.40
Elev	434	**Rwy/Length/ILS/ID**	1L/10300/109.10/ICNA
Lat	N64°48'		19R/10300/110.30/IFAI
Long	W147°51'		1R/3200
			19L/3200
			18/3980 Gravel
			36/3980 Gravel

Adak Island, AK – Adak Island

Ident	NUD	**ATIS**	—
Elev	18	**Rwy/Length**	05/7790
Lat	N51°52'		23/7790
Long	W176°38'		18/7606
			36/7606

Unalaska, AK – Unalaska

Ident	DUT	**ATIS**	122.60
Elev	22	**Rwy/Length**	12/3900
Lat	N53°53'		30/3900
Long	W166°32'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Adak	DME	NUD	113.00	N51°52'	W176°40'	—
Amchitka	VORTAC	NIA	113.20	N51°22'	E179°16'	—
Anchorage	VOR-DME	ANC	114.30	N61°09'	W150°12'	280
Annette Island	VORTAC	ANN	117.10	N55°03'	W131°34'	174
Barrow	VORTAC	BRW	116.20	N71°16'	W156°47'	40
Bethel	VORTAC	BET	114.10	N60°47'	W161°49'	130
Bettles	VORTAC	BTT	116.00	N66°54'	W151°32'	645
Big Delta	VORTAC	BIG	114.90	N64°00'	W145°43'	1230
Big Lake	VORTAC	BGQ	112.50	N61°34'	W149°58'	160
Biorka Island	VORTAC	BKA	113.80	N56°51'	W135°33'	240
Cold Bay	VORTAC	CDB	112.60	N55°16'	W162°46'	97
Deadhorse	VORTAC	SCC	113.90	N70°11'	W148°24'	50
Dillingham	VOR-DME	DLG	116.40	N58°59'	W158°33'	130
Dutch Harbor	DME	DUT	113.90	N53°54'	W166°32'	278
Emmonak	VOR-DME	ENM	117.80	N62°47'	W164°29'	14
Fairbanks	VORTAC	FAI	108.20	N64°48'	W148°00'	1493
Fort Yukon	VORTAC	FYU	114.40	N66°34'	W145°16'	425
Galena	VORTAC	GAL	114.80	N64°44'	W156°46'	130
Gulkana	VORTAC	GKN	115.60	N62°09'	W145°27'	1544
Homer	VORTAC	HOM	114.60	N59°42'	W151°27'	694
Hooper Bay	VOR-DME	HPB	115.20	N61°30'	W166°08'	176
Huslia	VOR-DME	HSL	117.40	N65°42'	W156°22'	122
Inuvik	VOR-DME	YEV	112.50	N68°18'	W133°32'	538
Johnstone Point	VORTAC	JOH	116.70	N60°28'	W146°35'	47
Kenai	VOR-DME	ENA	117.60	N60°36'	W151°11'	109
King Salmon	VORTAC	AKN	112.80	N58°43'	W156°45'	80
Kipnuk	VOR-DME	IIK	115.90	N59°56'	W164°02'	1
Kodiak	VORTAC	ODK	117.10	N57°46'	W152°20'	130
Kotzebue	VOR-DME	OTZ	115.70	N66°53'	W162°32'	120
Kukuliak	VOR-DME	ULL	117.30	N63°41'	W170°28'	830
Level Island	VOR-DME	LVD	116.50	N56°28'	W133°04'	100
Mc Grath	VORTAC	MCG	115.50	N62°57'	W155°36'	340
Middleton Island	VOR-DME	MDO	115.30	N59°25'	W146°21'	121
Moses Point	VOR-DME	MOS	116.30	N64°41'	W162°04'	14
Nenana	VORTAC	ENN	115.80	N64°35'	W149°04'	1600
Nome	VORTAC	OME	115.00	N64°29'	W165°15'	100
Northway	VORTAC	ORT	116.30	N62°56'	W141°54'	1178
Selawik	VOR-DME	WLK	114.20	N66°35'	W159°59'	11
Shemya	VORTAC	SYA	109.00	N52°43'	E174°03'	68
Sisters Island	VORTAC	SSR	114.00	N58°10'	W135°15'	50
Sparrevohn	VOR-DME	SQA	117.20	N61°05'	W155°38'	2501
Talkeetna	VOR-DME	TKA	116.20	N62°17'	W150°06'	360
Tanana	VOR-DME	TAL	116.60	N65°10'	W152°10'	390
Unalakleet	VORTAC	UNK	116.90	N63°53'	W160°41'	430
Yakutat	VORTAC	YAK	113.30	N59°30'	W139°38'	35

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Adak	NUD	347	N51°55'	W176°34'	—
Ambler	AMF	403	N67°06'	W157°51'	—
Aniak	ANI	359	N61°35'	W159°35'	—
Anvik	ANV	365	N62°38'	W160°11'	—
Attu	ATU	375	N52°49'	E173°10'	—
Barter Island	BTI	308	N70°07'	W143°38'	—
Bear Creek	BCC	212	N65°10'	W152°12	—
Bethel (LMM)	ET	344	N60°47'	W161°49'	—
Bishop	BZP	331	N64°44'	W156°48'	—
Borland	HBT	390	N55°18'	W160°31'	—
Browerville	VIR	281	N71°16'	W156°47'	—
Bruck (LOM)	AN	387	N61°10'	W150°10'	—
Buckland	BVK	325	N65°58'	W161°08'	26
Cairn Mountain	CRN	281	N61°05'	W155°33'	—
Campbell Lake	CMQ	338	N61°10'	W150°02'	—
Cape Lisburne	LUR	385	N68°51'	W166°04'	—
Cape Newenham	EHM	385	N58°39'	W162°04'	—

Location/Name	Ident	Freq	Lat	Long	Elev
Cape Romanzof	CZF	275	N61°47'	W165°58'	—
Chena	CUN	257	N64°50'	W147°29'	—
Clam Cove	CMJ	396	N55°20'	W131°41'	—
Coghlan Island	CGL	212	N58°21'	W134°41'	—
Delta Junction	DJN	347	N64°01'	W145°41'	—
Dutch Harbor	DUT	283	N53°54'	W166°32'	—
Eagle	EAA	519	N64°46'	W141°08'	—
Elephant	EEF	391	N58°10'	W135°15'	—
Elfee (LOM/NDB)	CD	341	N55°17'	W162°47'	—
Evansville	EAV	391	N66°53'	W151°33'	—
Farewell Lake	FXW	412	N62°32'	W153°37'	—
Fort Davis	FDV	529	N64°29'	W165°18'	—
Fort Richardson	FRN	196	N61°16'	W149°38'	—
Fox	FOX	356	N64°58'	W147°34'	—
Fredericks Point	FPN	372	N56°47'	W132°49'	—
Galbraith Lake	GBH	417	N68°28'	W149°29'	—
Gambell	GAM	369	N63°46'	W171°44'	—
Glacier River	GCR	404	N60°29'	W145°28'	—
Glennallen	GLA	248	N62°11'	W145°28'	—
Gold	OYN	208	N64°30'	W165°26'	—
Gustavus	GAV	219	N58°25'	W135°42'	—
Haines	HNS	245	N59°12'	W135°25'	—
Hinchinbrook	HBK	362	N60°23'	W146°05'	—
Ice Pool	ICW	525	N64°32'	W149°04'	—
Iliamna	ILI	328	N59°44'	W154°54'	209
Kachemak	ACE	277	N59°38'	W151°30'	—
Koyuk	KKA	299	N64°55'	W161°08'	1026
Kulik Lake	HCP	334	N59°01'	W155°36'	—
Mendenhall	MND	332	N58°21'	W134°38'	—
Minchumina	MHM	227	N63°53'	W152°18'	—
Mineral Creek	MNL	524	N61°07'	W146°21'	—
Mt Edgecumbe	IME	414	N57°02'	W135°22'	—
Nabesna	AES	390	N62°57'	W141°53'	—
Nanwak	AIX	323	N60°23'	W166°12'	—
Noatak	OQK	414	N67°34'	W162°58'	—
Norton Bay	OAY	263	N64°41'	W162°03'	—
Oliktok	OLI	329	N70°29'	W149°53'	—
Oscarville	OSE	251	N60°47'	W161°52'	—
Peters Creek	PEE	305	N62°19'	W150°05'	—
Pitsand	PYC	290	N70°19'	W149°38'	—
Point Hope	PHO	221	N68°20'	W166°47'	—
Point Lay	PIZ	347	N69°44'	W163°00'	—
Port Heiden	PDN	371	N56°57'	W158°38'	—
Priblof	SRI	399	N56°34'	W169°38'	—
Prospect	PPC	340	N66°49'	W150°38'	—
Prudhoe Bay	PUO	368	N70°14'	W148°23'	—
Puntilla Lake	PTI	397	N62°04'	W152°43'	—
Put River	PVQ	234	N70°13'	W148°25'	—
Saldo (LOM/NDB)	SALDO	400	N58°44'	W156°46'	—
Shemya	SYA	221	N52°43'	E174°03'	—
Shishmaref	SHH	365	N66°15'	W166°03'	—
Sitka	SIT	358	N56°51'	W135°32'	—
Skwentna	SKW	269	N61°57'	W151°12'	—
Soldotna	OLT	346	N60°28'	W150°52'	—
Summit	UMM	326	N63°19'	W149°07'	—
Sumner Strait	SQM	529	N56°27'	W133°05'	—
Takotna River	VTR	350	N62°56'	W155°33'	—
Tin City	TNC	347	N65°33'	W167°54'	—
Togiak	TOG	393	N59°03'	W160°22'	—
Umiat	UMT	360	N69°22'	W152°08'	—
Wearr (LOM)	FA	230	N64°53'	W147°42'	—
Wessels	ESS	260	N59°25'	W146°20'	—
Wildwood	IWW	379	N60°35'	W151°12'	—
Wiley	IEY	248	N71°17'	W156°48'	—
Wood River	BTS	429	N58°59'	W158°32'	—
Woody Island	RWO	394	N57°46'	W152°19'	—
Wrangell	RGL	206	N56°29'	W132°23'	—
Yakataga	CYT	209	N60°05'	W142°29'	—
Yukon River	FTO	242	N66°34'	W145°12'	—

Arizona

Airports

Grand Canyon, AZ – Grand Canyon Ntnl Pk

Ident	GCN	**ATIS**	124.30
Elev	6606	**Rwy/Length/ILS/ID**	03/8999/108.90/IGCN
Lat	N35°57'		21/8999
Long	W112°08'		

Phoenix, AZ – Sky Harbor Intl

Ident	PHX	**ATIS**	124.30
Elev	1133	**Rwy/Length/ILS/ID**	8R/10300/108.30/IPHX
Lat	N33°26'		26L/10300/111.75/IPZZ
Long	W112°00'		8L/110001
			26R/110001

Tucson, AZ – Avra Valley

Ident	E14	**ATIS**	—
Elev	2031	**Rwy/Length**	03/4200
Lat	N32°24'		21/4200
Long	W111°13'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Bard	VORTAC	BZA	116.80	N32°46'	W114°36'	130
Buckeye	VORTAC	BXK	110.60	N33°27'	W112°49'	1060
Cochise	VORTAC	CIE	115.80	N32°02'	W109°45'	4230
Douglas	VORTAC	DUG	108.80	N31°28'	W109°36'	4160
Drake	VORTAC	DRK	114.10	N34°42'	W112°28'	4960
Flagstaff	VOR-DME	FLG	108.20	N35°08'	W111°40'	7020
Gila Bend	VORTAC	GBN	116.60	N32°57'	W112°40'	790
Grand Canyon	VOR-DME	GCN	113.10	N35°57'	W112°08'	6670
Kingman	VOR-DME	IGM	108.80	N35°15'	W113°56'	3410
Libby	VOR	FHU	111.60	N31°35'	W110°20'	4625
Nogales	VOR-DME	OLS	108.20	N31°24'	W110°50'	3870
Page	VOR-DME	PGA	117.60	N36°55'	W111°27'	4245
Peach Springs	VORTAC	PGS	112.00	N35°37'	W113°32'	4760
Phoenix	VORTAC	PXR	115.60	N33°25'	W111°58'	1180
Pine Bluff	VORTAC	PBF	116.00	N34°14'	W91°55'	210
Saint Johns	VORTAC	SJN	112.30	N34°25'	W109°08'	6840
San Simon	VORTAC	SSO	115.40	N32°16'	W109°15'	3600
Stanfield	VORTAC	TFD	114.80	N32°53'	W111°54'	1316
Tuba City	VORTAC	TBC	113.50	N36°07'	W111°16'	5060
Tucson	VORTAC	TUS	116.00	N32°05'	W110°54'	2670
Willie	VORTAC	IWA	113.30	N33°18'	W111°39'	1370
Winslow	VORTAC	INW	112.60	N35°03'	W110°47'	4910

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Dragoo	DAO	410	N31°35'	W110°20'	4646
Falcon Field	FFZ	281	N33°27'	W111°43'	1392
Glendale	GEU	215	N33°31'	W112°17'	1083
Globe	GAZ	255	N33°21'	W110°39'	3195
Golden Eagle	OEG	413	N32°51'	W114°26'	200
Nogales	ENZ	394	N31°25'	W110°50'	3915
Pulliam	PUU	379	N35°08'	W111°40'	6994
Robles	RBJ	220	N32°04'	W111°21'	2607
Ryan	RYN	338	N32°08'	W111°09'	2415
Scottsdale	SDL	224	N33°37'	W111°54'	1542
Sedona	SEZ	334	N34°49'	W111°48'	—
Show Low	SOW	206	N34°16'	W110°00'	6411
Window Rock	AWR	254	N35°39'	W109°04'	—

Arkansas

Airports

Little Rock, AR – Adams Field

Ident	LIT	**ATIS**	125.65
Elev	260	**Rwy/Length/ILS/ID**	4L/6870/110.30/ILIT
Lat	N34°43'		22R/6870/110.30/IAAY
Long	W92°13'		4R/6155
			22L/6155/110.70/IBWY
			18/5084
			36/5084

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Drake	VOR-DME	DAK	108.80	N36°02'	W94°11'	1530
El Dorado	VORTAC	ELD	115.50	N33°15'	W92°44'	230
Flippin	VOR-DME	FLP	112.80	N36°17'	W92°27'	780
Fort Smith	VORTAC	FSM	110.40	N35°23'	W94°16'	430
Gilmore	VOR-DME	GQE	113.00	N35°20'	W90°28'	211
Gosnell	VOR	GOJ	111.80	N35°57'	W89°56'	255
Harrison	VOR-DME	HRO	112.50	N36°19'	W93°12'	1400
Hot Springs	VOR-DME	HOT	110.00	N34°28'	W93°05'	530
Jonesboro	VOR-DME	JBR	108.60	N35°52'	W90°35'	250
Little Rock	VORTAC	LIT	113.90	N34°40'	W92°10'	240
Monticello	VORTAC	MON	111.60	N33°33'	W91°42'	280
Razorback	VORTAC	RZC	116.40	N36°14'	W94°07'	1330
Texarkana	VORTAC	TXK	116.30	N33°30'	W94°04'	270
Walnut Ridge	VORTAC	ARG	114.50	N36°06'	W90°57'	260

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Arkadelphia	ADF	275	N34°03'	W93°06'	—
Ash Flat	AJX	344	N36°10'	W91°36'	815
Bakky (LOM)	HR	233	N36°11'	W93°09'	—
Bridge	BDQ	208	N35°08'	W92°42'	320
Brinkley	BKZ	242	N34°52'	W91°10'	—
Camden	CDH	335	N33°36'	W92°46'	—
Carter	CJD	263	N36°27'	W94°04'	—
Clarksville	CZE	201	N35°28'	W93°25'	450
Conway	CWS	302	N35°05'	W92°25'	317
Crossett	CRT	396	N33°10'	W91°53'	181
De Queen	DEQ	281	N34°02'	W94°23'	—

Location/Name	Ident	Freq	Lat	Long	Elev
Dumas	DZM	305	N33°53'	W91°31'	163
Forrest City	FCY	332	N34°56'	W90°46'	—
Heber Springs	HBZ	296	N35°30'	W92°00'	625
Hicks	IUI	299	N35°56'	W89°50'	254
Hope	HPC	362	N33°43'	W93°38'	340
Hossy (LOM/NDB)	HO	385	N34°25'	W93°11'	471
Independence Co	INY	317	N35°41'	W91°47'	470
Lados (LOM)	EL	418	N33°17'	W92°43'	140
Lasky (LOM/NDB)	LI	353	N34°40'	W92°18'	—
Lawrence Co	TNZ	227	N36°12'	W90°55'	316
Magnolia	AGO	266	N33°13'	W93°12'	311
Malvern	MVQ	215	N34°20'	W92°45'	535
Mena	MEZ	242	N34°32'	W94°12'	1055
Morrilton	MPJ	410	N35°07'	W92°55'	—
Newport	EWP	400	N35°38'	W91°10'	237
Ozark	OZZ	329	N35°30'	W93°50'	—
Peno Bottoms	AFT	311	N35°19'	W94°28'	—
Russellville	RUE	379	N35°15'	W93°05'	385
Searcy	SRC	323	N35°12'	W91°43'	260
Siloam Springs	SLG	284	N36°11'	W94°29'	1625
Stuttgart	SGT	269	N34°39'	W91°35'	226
Tecco (LOM)	TX	247	N33°31'	W93°54'	260
Thompson-Robbins	HEE	251	N34°34'	W90°40'	240
Toneyville	TYV	290	N34°57'	W92°01'	—
Walcott	PZX	221	N36°01'	W90°35'	471
Warren	REN	226	N33°32'	W92°05'	180
West Memphis	AWM	362	N35°08'	W90°13'	212
Wilcox	VLX	348	N35°52'	W92°05'	783
Wizer (LOM/NDB)	FS	223	N35°21'	W94°13'	—

California

Airports

Alameda, CA – Alameda NAS/Nimitz Field

Ident	NGZ	**ATIS**	—
Elev	14	**Rwy**	07
Lat	N37°47'		25
Long	W122°19'		13
			31

Angwin,CA – Parrett

Ident	203	**ATIS**	—
Elev	1848	**Rwy/Length**	—
Lat	N38°34'		
Long	W122°26'		

Auburn, CA – Auburn

Ident	AUN	**ATIS**	—
Elev	1520	**Rwy/Length**	—
Lat	N38°57'		
Long	W121°04'		

Avalon,CA – Catalina Island

Ident	AVX	**ATIS**	—
Elev	1602	**Rwy/Length**	04/3240
Lat	N33°24'		22/3240
Long	W118°24'		

Beckwourth, CA – Nervino

Ident	002	**ATIS**	—
Elev	4894	**Rwy/Length**	—
Lat	N39°49'		
Long	W120°21'		

Burbank, CA – Glendale-Pasadena

Ident	BUR	**ATIS**	134.5
Elev	775	**Rwy/Length**	—
Lat	N34°12'		
Long	W118°21'		

Byron, CA – Byron

Ident	C83	**ATIS**	—
Elev	76	**Rwy/Length**	—
Lat	N37°49'		
Long	W121°37'		

Cameron, CA – Cameron Park

Ident	061	**ATIS**	—
Elev	1286	**Rwy/Length**	—
Lat	N38°41'		
Long	W120°59'		

Carlsbad, CA – McClellan-Palomar

Ident	CRQ	**ATIS**	120.15
Elev	328	**Rwy/Length**	06/4700
Lat	N33°71'		24/4700
Long	W117°16'		

Carmel Valley, CA – Carmel Valley

Ident	062	**ATIS**	—
Elev	450	**Rwy/Length**	—
Lat	N36°28'		
Long	W121°43'		

Chico, CA – Chico Muni

Ident	CIC	**ATIS**	—
Elev	238	**Rwy/Length**	13L/6724
Lat	N39°47'		31R/6724
Long	W121°51'		13R/3005
			31L/3005

Chino, CA – Chino

Ident	CNO	**ATIS**	121.15
Elev	650	**Rwy/Length**	03/6032
Lat	N33°58'		21/6032
Long	W117°38'		08/4856
			26/4856

Clarksburg, CA – Borges

Ident	C14	**ATIS**	—
Elev	12	**Rwy/Length**	—
Lat	N38°26'		
Long	W121°30'		

Columbia, CA – Columbia

Ident	022	**ATIS**	—
Elev	2118	**Rwy/Length**	17/4670
Lat	N38°01'		35/4670
Long	W120°24'		11/2600 Grass
			28/2600 Grass

Compton, CA – Compton

Ident	CPM	**ATIS**	—
Elev	97	**Rwy/Length**	7R/3670
Lat	N33°53'		25L/3670
Long	W118°14'		7L/3670
			25R/3670

Concord, CA – Buchanan Field

Ident	CCR	**ATIS**	124.7
Elev	23	**Rwy/Length/ILS/ID**	1R/2768
Lat	N37°59'		19L/2768
Long	W122°03'		1L/4400
			19R/4400/108.5/ICCR
			14R/2800
			32L/2800
			14L/4601
			32R/4601

Corona, CA – Corona Muni

Ident	L66	**ATIS**	—
Elev	533	**Rwy/Length**	07/3200
Lat	N33°53'		25/3200
Long	W117°36'		

Crows Landing, CA – Crows Landing NALF

Ident	NRC	**ATIS**	—
Elev	165	**Rwy**	12
Lat	N37°24'		30
Long	W121°06'		17
			35

Davis, CA – University

Ident	005	**ATIS**	—
Elev	68	**Rwy/Length**	—
Lat	N38°31'		
Long	W121°47'		

Davis Woodland Winters, CA – Yolo Co.

Ident	2Q3	**ATIS**	—
Elev	98	**Rwy/Length**	—
Lat	N38°34'		
Long	W121°51'		

El Monte, CA – El Monte

Ident	EMT	**ATIS**	118.75
Elev	296	**Rwy/Length**	01/3995
Lat	N34°05'		19/3995
Long	W118°02'		

Elk Grove, CA – Sunset Skyranch

Ident	Q40	**ATIS**	—
Elev	54	**Rwy/Length**	—
Lat	N38°23'		
Long	W121°19'		

Emigrant Gap, CA – Blue Canyon/Nyack

Ident	BLU	**ATIS**	—
Elev	5284	**Rwy/Length**	—
Lat	N39°16'		
Long	W120°42'		

Fallbrook, CA – Fallbrook Community Airpark

Ident	L18	**ATIS**	—
Elev	708	**Rwy/Length**	18/2160
Lat	N33°21'		36/2160
Long	W117°14'		

Fairfield, CA – Travis AFB

Ident	SUU	**ATIS**	116.4
Elev	62	**Rwy/Length/ILS/ID**	03L//110.1/ITXV
Lat	N38°15'		21L//110.1/ISUU
Long	W121°55'		

Franklin, CA – Franklin

Ident	Q53	**ATIS**	—
Elev	21	**Rwy/Length**	—
Lat	N38°18'		
Long	W121°25'		

Fresno, CA – Chandler Downtown

Ident	FCH	**ATIS**	—
Elev	278	**Rwy/Length**	12R/3202
Lat	N36°43'		30L/3202
Long	W119°49'		12L/3006
			30R/3006

Fresno, CA – Fresno Air Terminal

Ident	FAT	**ATIS**	121.35
Elev	333	**Rwy/Length**	11R/7206
Lat	N36°46'		29L/7206
Long	W119°42'		11L/9222
			29R/9222

Ft Ord, CA – Fritzsche

Ident		**ATIS**	124.6
Elev	134	**Rwy/Length**	—
Lat	N36°40'		
Long	W121°45'		

Garberville, CA – Garberville

Ident	O16	**ATIS**	—
Elev	545	**Rwy/Length**	18/3050
Lat	N40°05'		36/3050
Long	W123°48'		

Georgetown, CA – Georgetown

Ident	Q61	**ATIS**	—
Elev	2588	**Rwy/Length**	—
Lat	N38°55'		
Long	W120°51'		

Gualala, CA – Gualala

Ident	Q69	**ATIS**	—
Elev	940	**Rwy/Length**	—
Lat	N38°48'		
Long	W123°31'		

Gustine, CA – Gustine

Ident	3O1	**ATIS**	—
Elev	75	**Rwy/Length**	—
Lat	N37°15'		
Long	W120°57'		

Half Moon Bay, CA – Half Moon Bay

Ident	HAF	**ATIS**	—
Elev	67	**Rwy/Length**	12/5000
Lat	N37°30'		30/5000
Long	W122°30'		

Hawthorne, CA – Hawthorne Muni

Ident	HHR	**ATIS**	118.4
Elev	63	**Rwy/Length**	07/4956
Lat	N33°55'		25/4956
Long	W118°20'		

Hayward, CA – Hayward Air Terminal

Ident	HWD	**ATIS**	126.7
Elev	47	**Rwy/Length/ILS/ID**	10R/5024
Lat	N37°39'		28L/5024/111.5/IHWD
Long	W122°07'		10L/3107
			28R/3107

Healdsburg, CA – Healdsburg

Ident	O31	**ATIS**	—
Elev	278	**Rwy/Length**	—
Lat	N38°39'		
Long	W122°54'		

Hollister, CA – Frazier Lake

Ident	1C9	**ATIS**	—
Elev	151	**Rwy/Length**	—
Lat	N36°57'		
Long	W121°27'		

Hollister, CA – Hollister Muni

Ident	3O7	**ATIS**	—
Elev	230	**Rwy/Length**	—
Lat	N36°53'		
Long	W121°24'		

Jackson, CA – Westover/Amador Co.

Ident	O70	**ATIS**	—
Elev	1690	**Rwy/Length**	—
Lat	N38°22'		
Long	W120°47'		

King City, CA – Mesa Del Rey

Ident	KIC	**ATIS**	—
Elev	370	**Rwy/Length**	—
Lat	N36°13'		
Long	W121°07'		

La Verne, CA – Brackett Field

Ident	POC	**ATIS**	—
Elev	1011	**Rwy/Length**	08R/4839
Lat	N34°05'		26L/4839
Long	W117°46'		08L/3661
			26R/3661

Lakeport, CA – Lampson

Ident	102	**ATIS**	—
Elev	1378	**Rwy/Length**	—
Lat	N38°59'		
Long	W122°54'		

Lincoln, CA – Lincoln Regl.

Ident	051	**ATIS**	—
Elev	119	**Rwy/Length**	—
Lat	N38°54'		
Long	W121°21'		

Little River, CA – Little River

Ident	048	**ATIS**	—
Elev	572	**Rwy/Length**	11/5250
Lat	N39°15'		29/5250
Long	W123°45'		

Livermore, CA – Livermore Muni

Ident	LVK	**ATIS**	119.65
Elev	397	**Rwy/Length/ILS/ID**	07L/5255
Lat	N37°41'		25R/5255/110.5/ILVK
Long	W121°49'		07R/2699
			25L/2699

Loch Lomond, CA – Loch Lomond

Ident	Q79	**ATIS**	—
Elev	2080	**Rwy/Length**	—
Lat	N38°52'		
Long	W122°40'		

Lodi, CA – Kingdon Airpark

Ident	020	**ATIS**	—
Elev	15	**Rwy/Length**	12/4000
Lat	N38°05'		30/4000
Long	W121°21'		

Lodi, CA – Lodi

Ident	103	**ATIS**	—
Elev	58	**Rwy/Length**	08/3085
Lat	N38°12'		26/3085
Long	W121°16'		12/2070
			30/2070

Lodi, CA – Lodi Airpark

Ident	Q80	**ATIS**	—
Elev	25	**Rwy/Length**	—
Lat	N38°05'		
Long	W121°19'		

Long Beach, CA – Long Beach

Ident	LGB	**ATIS**	127.75
Elev	57	**Rwy/Length/ILS/ID**	30//110.3/ILGB
Lat	N33°49'		
Long	W118°09'		

Los Angeles, CA – Los Angeles Intl

Ident	LAX	**ATIS**	135.65
Elev	126	**Rwy/Length/ILS/ID**	06R/10285/111.70/IGPE
Lat	N33°57'		24L/10285/111.70/IHQB
Long	W118° 24'		06L/8925/108.50/IUWU
			24R/8925/108.50/IOSS
			07R/11096/109.90/IMKZ
			25L/11096/109.90/ILAX
			07L/12091/111.10/IIAS
			25R/12091/111.10/ICFN

Markleeville, CA – Alpine Co.

Ident	Q82	**ATIS**	—
Elev	5867	**Rwy/Length**	—
Lat	N38°44'		
Long	W119°45'		

Marysville, CA – Yuba County

Ident	MYV	**ATIS**	—
Elev	62	**Rwy/Length**	05/3281
Lat	N39°05'		23/3281
Long	W121°24'		14/6006
			32/6006

Merced, CA – Merced Muni – Macready Field

Ident	MCE	**ATIS**	—
Elev	153	**Rwy/Length**	12/5903
Lat	N37°17'		30/5903
Long	W120°30'		

Modesto, CA – Modesto City

Ident	MOD	**ATIS**	127.7
Elev	97	**Rwy/Length/ILS/ID**	10R/3459
Lat	N37°37'		28L/3459
Long	W120°57'		10L/5911
			28R/5911/111.9/IMOD

Monterey, CA – Monterey Peninsula

Ident	MRY	**ATIS**	119.25
Elev	254	**Rwy/Length/ILS/ID**	10R/7598/110.7/IMRY
Lat	N36°35'		28L/7298/110.7/IMTB
Long	W121°50'		10L/9501
			28R/9501

Mountain View, CA – Moffett Field NAS

Ident	NUQ	**ATIS**	—
Elev	34	**Rwy**	14R
Lat	N37°24'		32L
Long	W122°02'		14L
			32R

Napa, CA – Napa Co.

Ident	APC	**ATIS**	124.05
Elev	33	**Rwy/Length/ILS/ID**	36L//111.3/IAPC
Lat	N38°12'		
Long	W122°16'		

Novato, CA – Gnoss

Ident	O56	**ATIS**	—
Elev	2	**Rwy**	—
Lat	N38°08'		
Long	W122°33'		

Novato, CA – Hamilton (AFB)

Ident	NZZ	**ATIS**	—
Elev	2	**Rwy**	12
Lat	N38°03'		30
Long	W122°30'		

Oakland, CA – Metro Oakland Intl

Ident	OAK	**ATIS**	128.50
Elev	6	**Rwy/Length/ILS/ID**	09R/6212
Lat	N37°43'		27L/6212
Long	W122°13'		09L/5453
			27R/5453/109.90/IOAK
			11/10000/111.90/IAAZ
			29/10000/108.70/IINB
			15/3366
			33/3366

Oceanside, CA – Oceanside Muni

Ident	L32	**ATIS**	—
Elev	28	**Rwy/Length**	06/3061
Lat	N33°13'		24/3061
Long	W117°21'		

Ontario, CA – Ontario Intl

Ident	ONT	**ATIS**	124.25
Elev	943	**Rwy/Length/ILS/ID**	08L/12200/109.70/IAOD
Lat	N34°03'		26R/12200/109.70/IONT
Long	W117°36'		08R/10200
			26L/10200/109.70/ITWO

Oroville, CA – Oroville Muni

Ident	OVE	**ATIS**	—
Elev	190	**Rwy/Length**	01/4528
Lat	N39°29'		19/4528
Long	W121°37'		12/3280
			30/3280

Palo Alto, CA – Palo Alto

Ident	PAO	**ATIS**	120.6
Elev	5	**Rwy/Length**	12/2500
Lat	N37°27'		30/2500
Long	W122°06'		

Petaluma, CA – Petaluma Muni

Ident	O69	**ATIS**	—
Elev	87	**Rwy/Length**	—
Lat	N38°15'		
Long	W122°36'		

Placerville, CA – Placerville

Ident	PVF	**ATIS**	—
Elev	2583	**Rwy/Length**	05/4200
Lat	N38°43'		23/4200
Long	W120°45'		

Porterville, CA – Porterville

Ident	PTV	**ATIS**	—
Elev	442	**Rwy/Length**	12/5908
Lat	N36°01'		30/5908
Long	W119°03'		

Rancho Murieta, CA – Rancho Murieta

Ident	RIU	**ATIS**	—
Elev	142	**Rwy/Length**	—
Lat	N38°29'		
Long	W121°06'		

Red Bluff, CA – Red Bluff Muni

Ident	RBL	**ATIS**	—
Elev	349	**Rwy/Length**	15/5984
Lat	N40°09'		33/5984
Long	W122°15'		

Rio Linda, CA – Rio Linda

Ident	Q94	**ATIS**	—
Elev	45	**Rwy/Length**	—
Lat	N38°40'		
Long	W121°26'		

Rio Vista, CA – Rio Vista Muni

Ident	O88	**ATIS**	—
Elev	20	**Rwy/Length**	—
Lat	N38°11'		
Long	W121°42'		

Riverside, CA – Riverside Muni

Ident	RAL	**ATIS**	128.8
Elev	816	**Rwy/Length**	09/5400
Lat	N33°57'		27/5400
Long	W117°26'		16/2850
			34/2850

Sacramento, CA – Mather AFB

Ident	MHR	**ATIS**	119.15
Elev	96	**Rwy/Length/ILS/ID**	22L/110.7/IMHR
Lat	N38°33'		04R/110.7/IPOK
Long	W121°17'		

Sacramento, CA – McClellan AFB

Ident	MCC	**ATIS**	109.2
Elev	75	**Rwy/ILS/ID**	16/109.7/IMCC
Lat	N38°40'		34/109.7/IFKZ
Long	W121°24'		

Sacramento, CA – Natomas

Ident	Q96	**ATIS**	—
Elev	22	**Rwy/Length**	—
Lat	N38°18'		
Long	W121°30'		

Sacramento, CA – Sacramento Metro

Ident	SMF	**ATIS**	126.75
Elev	25	**Rwy/Length/ILS/ID**	16R/8600/111.1/ISMF
Lat	N38°41'		34L/8600/111.1/IHUX
Long	W121°35'		16L/8600/111.75/IMDK
			34R/8600

Sacramento, CA – Sacramento Executive

Ident	SAC	**ATIS**	125.5
Elev	21	**Rwy/Length/ILS/ID**	02/5503/110.3/ISAC
Lat	N38°30'		20/5503
Long	W121°29'		12/3836
			30/3836
			16/3485
			34/3485

Salinas, CA – Salinas Muni

Ident	SNS	**ATIS**	124.85
Elev	84	**Rwy/Length/ILS/ID**	08/5005
Lat	N36°39'		26/5005
Long	W121°36'		13/4825
			31/4825/108.5/ISNS
			14
			32

San Andreas, CA – Calaveras Co.-Rasmussen

Ident	003	**ATIS**	—
Elev	1325	**Rwy/Length**	—
Lat	N38°08'		
Long	W120°38'		

San Carlos, CA – San Carlos

Ident	SQL	**ATIS**	125.9
Elev	2	**Rwy/Length**	12/2600
Lat	N37°30'		30/2600
Long	W122°15'		

San Diego, CA – San Diego Intl-Lindbergh Field

Ident	SAN	**ATIS**	134.80
Elev	14	**Rwy/Length/ILS/ID**	09/9400/110.90/ISAN
Lat	N32°44'		27/9400
Long	W117°11'		13/4439
			31/4439

San Francisco, CA – San Francisco Intl

Ident	SFO	**ATIS**	118.85
Elev	11	**Rwy/Length/ILS/ID**	1R/8901
Lat	N37°37'		19L/8901/108.90/ISIA
Long	W122°22'		1L/7001
			19R/7001
			10R/10600
			28L/10600/109.55/ISFO
			10L/11870
			28R/11870/111.70/IGWQ

San Jose, CA – Reid-Hillview

Ident	RHV	**ATIS**	125.2
Elev	133	**Rwy/Length**	13L/3101
Lat	N37°20'		31R/3101
Long	W121°49'		13R/3099
			31L/3099

San Jose, CA – San Jose Intl

Ident	SJC	**ATIS**	126.95
Elev	58	**Rwy/Length/ILS/ID**	11/4599
Lat	N37°21'		29/4599
Long	W121°55'		12R/10200/110.9/ISLV
			30L/10200/110.9/ISJC
			12L/4419
			30R/4419

San Martin, CA – South Co. of Santa Clara

Ident	Q99	**ATIS**	—
Elev	281	**Rwy/Length**	—
Lat	N37°04'		
Long	W121°35'		

San Rafael, CA – Hamilton

Ident	CA35	**ATIS**	—
Elev	3	**Rwy/Length**	—
Lat	N38°03'		
Long	W122°3'0		

Santa Ana, CA – John Wayne Apt/Orange County

Ident	SNA	**ATIS**	126.00
Elev	54	**Rwy/Length/ILS/ID**	01R/2887
Lat	N33°40'		19L/2887
Long	W117°52'		01L/5700
			19R/5700/111.75/ISNA
			19R/5700/108.3/IOJW

Santa Barbara, CA – Santa Barbara Muni

Ident	SBA	**ATIS**	—
Elev	10	**Rwy/Length/ILS/ID**	07/6052/110.30/ISBA
Lat	N34°25'		25/6052
Long	W119°50'		15R/4183
			33L/4183
			15L/4179
			33R/4179

Santa Monica, CA – Santa Monica Muni

Ident	SMO	**ATIS**	119.15
Elev	175	**Rwy/Length**	03/4987
Lat	N34°00'		21/4987
Long	W118°27'		

Santa Rosa, CA – Sonama County

Ident	STS	**ATIS**	120.55
Elev	125	**Rwy/Length/ILS/ID**	14/5115
Lat	N38°30'		32/5115/109.3/ISTS
Long	W122°48'		01/5002
			19/5002

Schellville-Sonoma, CA – Sonama Valley

Ident	0Q3	**ATIS**	—
Elev	10	**Rwy/Length**	—
Lat	N38°13'		
Long	W122°27'		

Sierraville, CA – Dearwater

Ident	079	**ATIS**	—
Elev	4984	**Rwy/Length**	—
Lat	N39°34'		
Long	W120°21'		

Sonoma, CA – Sonoma Skypark

Ident	0Q9	**ATIS**	—
Elev	20	**Rwy/Length**	—
Lat	N38°15'		
Long	W122°26'		

South Lake Tahoe, CA – Lake Tahoe

Ident	TVL	**ATIS**	—
Elev	6264	**Rwy/Length/ILS/ID**	18/8544/108.9/ITVL
Lat	N38°53'		36/8544
Long	W119°59'		

Stockton, CA – Sharpe Army Depot

Ident	LRO	**ATIS**	—
Elev	18	**Rwy/Length**	—
Lat	N37°50'		
Long	W121°16'		

Stockton, CA – Stockton Metro

Ident	SCK	**ATIS**	—
Elev	30	**Rwy/Length/ILS/ID**	11L/8650
Lat	N37°53'		29R/8650/109.1/ISCK
Long	W121°14'		11R/2996
			29L/2996

Torrance, CA – Zamperini Field

Ident	TOA	**ATIS**	125.6
Elev	101	**Rwy/Length**	11R/3000
Lat	N33°48'		29L/3000
Long	W118°20'		11L/5000
			29R/5000

Tracy, CA – Tracy Muni

Ident	TCY	**ATIS**	—
Elev	192	**Rwy/Length**	—
Lat	N37°41'		
Long	W121°26'		

Truckee, CA – Truckee-Tahoe

Ident	TRK	**ATIS**	—
Elev	5900	**Rwy/Length**	01/4650
Lat	N39°19'		19/4650
Long	W120°08'		10/7000
			28/7000

Vacaville, CA – Nut Tree

Ident	045	**ATIS**	—
Elev	114	**Rwy/Length**	—
Lat	N38°22'		
Long	W121°57'		

Van Nuys, CA – Van Nuys

Ident	VNY	**ATIS**	118.45
Elev	799	**Rwy/Length/ILS/ID**	16R/8001/111.30/IVNY
Lat	N34°12'		34L/8001
Long	W118°29'		16L/4000
			34R/4000

Visalia, CA – Visalia Muni

Ident	VIS	**ATIS**	—
Elev	292	**Rwy/Length**	12/6556
Lat	N36°19'		30/6556
Long	W119°23'		

Watsonville, CA – Watsonville Muni

Ident	WVI	**ATIS**	—
Elev	160	**Rwy/Length/ILS/ID**	02/4501/108.3/IAYN
Lat	N36°56'		20/4501
Long	W121°47'		08/3999
			26/3999

Willows, CA – Willows-Glenn County

Ident	WLW	**ATIS**	—
Elev	139	**Rwy/Length**	16/7506
Lat	N39°30'		34/7506
Long	W122°12'		13/4210
			31/4210

Woodland, CA – Watts-Woodland

Ident	041	**ATIS**	—
Elev	125	**Rwy/Length**	—
Lat	N38°40'		
Long	W121°52'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Arnedee	VOR-DME	AHC	109.00	N40°16'	W120°09'	4008
Arcata	VOR-DME	ACV	110.20	N40°58'	W124°06'	191
Avenal	VORTAC	AVE	117.10	N35°38'	W119°58'	710
Beale	VOR	BAB	108.60	N39°08'	W121°26'	165
Big Sur	VORTAC	BSR	114.00	N36°10'	W121°38'	4080
Bishop	VOR-DME	BIH	109.60	N37°22'	W118°21'	4110
Blythe	VORTAC	BLH	117.40	N33°35'	W114°45'	410
Camarillo	VOR-DME	CMA	115.80	N34°12'	W119°05'	60
Camp Pendleton	VOR	NFG	111.80	N33°18'	W117°21'	75
Chico	VOR-DME	CIC	109.80	N39°47'	W121°50'	220
China Lake	VORTAC	NID	111.60	N35°41'	W117°41'	2272
Clovis	VORTAC	CZQ	112.90	N36°53'	W119°48'	360
Concord	VOR-DME	CCR	117.00	N38°02'	W122°02'	5
Crescent City	VORTAC	CEC	109.00	N41°46'	W124°14'	50
Daggett	VORTAC	DAG	113.20	N34°57'	W116°34'	1760
Edwards	VORTAC	EDW	116.40	N34°58'	W117°43'	2354
El Nido	VOR-DME	HYP	114.20	N37°13'	W120°24'	180
Fellows	VORTAC	FLW	117.50	N35°05'	W119°51'	3870
Fillmore	VORTAC	FIM	112.50	N34°21'	W118°52'	2200
Fort Jones	VORTAC	FJS	109.60	N41°26'	W122°48'	4900
Fortuna	VORTAC	FOT	114.00	N40°40'	W124°14'	400
Friant	VORTAC	FRA	115.60	N37°06'	W119°35'	2380
Gaviota	VORTAC	GVO	113.80	N34°31'	W120°05'	2620
Goffs	VORTAC	GFS	114.40	N35°07'	W115°10'	4000
Gorman	VORTAC	GMN	116.10	N34°48'	W118°51'	4920
Guadalupe	VOR	GLJ	111.00	N34°57'	W120°31'	140
Hangtown	VOR-DME	HNW	115.50	N38°43'	W120°44'	2600
Hector	VORTAC	HEC	112.70	N34°47'	W116°27'	1850
Homeland	VOR	HDF	113.40	N33°46'	W117°11'	1414
Imperial	VORTAC	IPL	115.90	N32°44'	W115°30'	-20
Julian	VORTAC	JLI	114.00	N33°08'	W116°35'	5560
Lake Hughes	VORTAC	LHS	108.40	N34°40'	W118°34'	5790
Linden	VORTAC	LIN	114.80	N38°04'	W121°00'	260
Los Angeles	VORTAC	LAX	113.60	N33°55'	W118°25'	180
Manteca	VORTAC	ECA	116.00	N37°50'	W121°10'	40
Marine El Toro	VORTAC	NZJ	117.20	N33°40'	W117°43'	357
Marysville	VOR-DME	MYV	110.80	N39°05'	W121°34'	60
Maxwell	VORTAC	MXW	110.00	N39°19'	W122°13'	110
Mc Clellan	VORTAC	MCC	109.20	N38°40'	W121°24'	72
Mendocino	VORTAC	ENI	112.30	N39°03'	W123°16'	2980
Mission Bay	VORTAC	MZB	117.80	N32°46'	W117°13'	10
Modesto	VOR-DME	MOD	114.60	N37°37'	W120°57'	90
Morro Bay	VORTAC	MQO	112.40	N35°15'	W120°45'	1462
Needles	VORTAC	EED	115.20	N34°45'	W114°28'	620
Oakland	VORTAC	OAK	116.80	N37°43'	W122°13'	10
Oceanside	VORTAC	OCN	115.30	N33°14'	W117°25'	90
Palm Springs	VORTAC	PSP	115.50	N33°52'	W116°25'	1600
Palmdale	VORTAC	PMD	114.50	N34°37'	W118°03'	2500
Panoche	VORTAC	PXN	112.60	N36°42'	W120°46'	2060
Paradise	VORTAC	PDZ	112.20	N33°55'	W117°31'	1430
Parker	VORTAC	PKE	117.90	N34°06'	W114°40'	1000

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Paso Robles	VORTAC	PRB	114.30	N35°40'	W120°37'	820
Poggi	VORTAC	PGY	109.80	N32°36'	W116°58'	580
Point Reyes	VORTAC	PYE	113.70	N38°04'	W122°52'	1340
Pomona	VORTAC	POM	110.40	N34°04'	W117°47'	1260
Porterville	VOR-DME	PTV	109.20	N35°54'	W119°01'	580
Priest	VOR	ROM	110.00	N36°08'	W120°39'	3880
Red Bluff	VORTAC	RBL	115.70	N40°05'	W122°14'	320
Redding	VOR-DME	RDD	108.40	N40°30'	W122°17'	490
Riverside	VOR	RAL	112.40	N33°57'	W117°26'	780
Sacramento	VORTAC	SAC	115.20	N38°26'	W121°33'	10
Salinas	VORTAC	SNS	117.30	N36°39'	W121°36'	80
San Francisco	VOR-DME	SFO	115.80	N37°37'	W122°22'	10
San Jose	VOR-DME	SJC	114.10	N37°22'	W121°56'	40
San Marcus	VORTAC	RZS	114.90	N34°30'	W119°46'	3620
Santa Catalina	VORTAC	SXC	111.40	N33°22'	W118°25'	2090
Santa Monica	VOR-DME	SMO	110.80	N34°00'	W118°27'	120
Santa Rosa	VOR-DME	STS	113.00	N38°30'	W122°48'	140
Sausalito	VORTAC	SAU	116.20	N37°51'	W122°31'	1040
Scaggs Island	VORTAC	SGD	112.10	N38°10'	W122°22'	10
Seal Beach	VORTAC	SLI	115.70	N33°46'	W118°03'	20
Shafter	VORTAC	EHF	115.40	N35°29'	W119°05'	550
Squaw Valley	VOR-DME	SWR	113.20	N39°10'	W120°16'	8850
Thermal	VORTAC	TRM	116.20	N33°37'	W116°09'	-110
Travis	VOR	TZZ	116.40	N38°20'	W121°48'	30
Twentynine Palms	VORTAC	TNP	114.2	N34°06'	W115°46'	1350
Van Nuys	VOR-DME	VNY	113.10	N34°13'	W118°29'	810
Ventura	VOR-DME	VTU	108.20	N34°06'	W119°02'	1560
Visalia	VOR-DME	VIS	109.40	N36°22'	W119°28'	260
Williams	VORTAC	ILA	114.40	N39°04'	W122°01'	50
Woodside	VORTAC	OSI	113.90	N37°23'	W122°16'	2170

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Abeta (LMM)	CV	233	N40°57'	W124°05'	159
Alturas	ARU	215	N41°28'	W120°33'	—
Becca (LOM)	LG	233	N33°45'	W118°04'	—
Boing (LMM)	AN	245	N32°44'	W117°12'	—
Brijj (LOM)	SF	379	N37°34'	W122°15'	—
Chandler	FCH	344	N36°43'	W119°50'	—
China Lake (Navy)	NID	348	N35°41'	W117°41'	2272
Chualar	UAD	263	N36°29'	W121°28'	105
Columbia	CUF	404	N38°01'	W120°24'	2112
Compton	CPM	378	N33°53'	W118°14'	—
Deoro (LOM)	MY	210	N32°46'	W117°02'	537
El Monte	EMT	359	N34°05'	W118°01'	—
Execc (LOM)	SA	356	N38°26'	W121°32'	5
General Fox	GWF	282	N34°44'	W118°13'	—
Halow (LOM/NDB)	MY	222	N39°10'	W121°36'	64
Hilan (LOM)	FA	266	N36°43'	W119°38'	340

Location/Name	Ident	Freq	Lat	Long	Elevv
Hunter Liggett	HGT	209	N35°56'	W121°09'	—
Jorge (LMM)	JC	249	N37°20'	W121°54'	—
Jotly (LOM)	SC	271	N37°49'	W121°08'	52
Kanan (LOM)	CC	335	N38°02'	W122°02'	5
Kearn (LOM)	UK	371	N39°16'	W123°14'	871
Lampson	LOP	217	N38°59'	W122°53'	1355
Lanee (LOM)	HU	400	N38°37'	W121°36'	15
Lassn (LOM)	RD	367	N40°23'	W122°17'	—
Lompoc	LPC	223	N34°39'	W120°27'	74
Maagg (LMM)	NA	337	N33°41'	W117°51'	53
Metre (LOM)	SM	230	N38°47'	W121°35'	15
Montague	MOG	382	N41°43'	W122°28'	2620
Munso (LOM)	MR	385	N36°37'	W121°56'	—
Niley (LOM)	BF	385	N35°21'	W118°58'	398
Norde (LOM)	CI	327	N39°53'	W121°55'	248
Oroville	OVE	212	N39°29'	W121°37'	199
Pacoima	PAI	370	N34°15'	W118°24'	—
Pajar (LOM/NDB)	AY	327	N36°54'	W121°48'	93
Petis (LOM/NDB)	SB	397	N34°03'	W117°21'	—
Proberta	PBT	338	N40°06'	W122°14'	400
Reiga (LOM/NDB)	LV	374	N37°41'	W121°41'	683
Romen (LOM)	OS	278	N33°57'	W118°16'	136
Roray (LMM)	AK	341	N37°43'	W122°11'	10
Salyer Farms	COR	205	N36°05'	W119°32'	—
San Clemente	NUC	350	N33°01'	W118°34'	180
San Jacinto	SJY	227	N33°47'	W116°59'	1498
San Nicolas Navy	NSI	203	N33°14'	W119°26'	—
Santa Ynez	IZA	394	N34°36'	W120°04'	656
Sharpe	LRO	282	N37°49'	W121°16'	—
Swan Lake (LOM/NDB)	LKA	257	N33°58'	W117°33'	666
Villa (LOM)	VI	220	N36°15'	W119°18'	306
Vinee (LMM)	UR	253	N34°11'	W118°22'	727
Wowar (LOM)	MO	367	N37°34'	W120°51'	115

Colorado

Airports

Denver, CO – Denver Intl

Ident	DIA	**ATIS**	125.60
Elev	5431	**Rwy/Length/ILS/ID**	07/12000/111.55/IDZG
Lat	N39°51'		25/12000/111.55/IERP
Long	W104°40'		08/12000/108.90/IFUI
			26/12000/108.90/IJOY
			16/12000/111.10/ILTT
			34/12000/111.10/IOUF
			17L/12000/110.15/IBXP
			35R/12000/110.15/IDPP
			17R/12000/108.50/IACX
			35L/12000/108.50/IAQD

Denver, CO – Stapleton Intl

Ident	DEN	**ATIS**	124.45
Elev	5333	**Rwy/Length/ILS/ID**	07/4871
Lat	N39°46'		25/4871
Long	W104°52'		8R/10004/110.30/IGQW
			26L/10004/110.30/IDEN
			8L/8599
			26R/8599
			17R/11500
			35L/11500/110.70/ISPO
			17L/12000/109.30/IHMX
			35R/12000/109.30/IRRV
			18/7750/111.90/IUGT
			36/7750/111.90/IEBC

Telluride, CO – Telluride

Ident	TEX	**ATIS**	—
Elev	9078	**Rwy/Length**	09/6870
Lat	N37°57'		27/6870
Long	W107°54'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Akron	VORTAC	AKO	114.40	N40°09'	W103°10'	4620
Alamosa	VORTAC	ALS	113.90	N37°20'	W105°48'	7530
Blue Mesa	VORTAC	HBU	114.90	N38°27'	W107°02'	8730
Buckley	VOR	BKF	109.60	N39°42'	W104°45'	5580
Butts	VOR	FCS	108.80	N38°40'	W104°45'	5829
Byers	VOR/DME	BVR	113.50	N39°46'	W103°55'	5252
Colorado Springs	VORTAC	COS	112.50	N38°56'	W104°38'	6930
Cones	VOR-DME	ETL	110.20	N38°02'	W108°15'	8460
Cortez	VOR-DME	CEZ	108.40	N37°23'	W108°33'	6220
Denver	VORTAC	DEN	117.00	N39°48'	W104°53'	5334
Denver	VOR-DME	DEN	117.90	N39°48'	W104°39'	5440
Dove Creek	VORTAC	DVC	114.60	N37°48'	W108°55'	6990
Durango	VOR-DME	DRO	108.20	N37°09'	W107°44'	6660
Falcon	VORTAC	FQF	116.30	N39°41'	W104°37'	5789
Fruita	VOR	RHU	109.00	N39°11'	W108°38'	4710
Gill	VORTAC	GLL	114.20	N40°30'	W104°33'	4910
Grand Junction	VORTAC	JNC	112.40	N39°03'	W108°47'	7100
Hayden	VOR-DME	CHE	115.60	N40°31'	W107°18'	7230
Hugo	VORTAC	HGO	112.10	N38°48'	W103°37'	5233
Jeffco	VOR-DME	BJC	115.40	N39°54'	W105°08'	5734
Kremmling	VORTAC	RLG	113.80	N40°00'	W106°26'	9370
Lamar	VORTAC	LAA	116.90	N38°11'	W102°41'	3950
Meeker	VORTAC	EKR	115.20	N40°04'	W107°55'	7620
Mile High	VORTAC	DVV	114.70	N39°53'	W104°37'	5270
Montrose	VOR-DME	MTJ	117.10	N38°30'	W107°53'	5710
Pueblo	VORTAC	PUB	116.70	N38°17'	W104°25'	4760
Red Table	VOR-DME	DBL	113.00	N39°26'	W106°53'	11758
Rifle	VOR-DME	RIL	110.60	N39°31'	W107°42'	5529
Robert	VOR-DME	BQZ	112.20	N40°27'	W106°52'	8251
Snow	VOR-DME	SXW	109.20	N39°37'	W106°59'	8060
Thurman	VORTAC	TXC	112.90	N39°41'	W103°12'	4890
Tobe	VORTAC	TBE	115.80	N37°15'	W103°36'	5730

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Aruba (LOM/NDB)	TF	373	N38°17'	W104°21'	4671
Batten	BAJ	392	N40°31'	W103°13'	4025
Betee(LMM/NDB)	PO	308	N39°45'	W104°52'	5311
Carbondale	COL	344	N39°24'	W107°09'	—
Casse (LOM/NDB)	AP	260	N39°27'	W104°50'	6412
Colln (LOM)	FN	400	N40°21'	W104°58'	4957
Eagle	EGE	357	N39°38'	W106°54'	—
Greey (LOM)	GS	348	N40°27'	W104°46'	4076
Heginbotham	HEQ	404	N40°34'	W102°16'	3717
Ironhorse	IHS	335	N38°40'	W104°45'	—
Kit Carson	ITR	209	N39°14'	W102°17'	4200
La Junta	LHX	239	N38°02'	W103°37'	—
Laporte	LQP	387	N40°34'	W105°02'	—
Leadville	LXV	236	N39°13'	W106°18'	9958
Mertz (LOM)	PU	302	N38°17'	W104°38'	—
Monte Vista	MVI	311	N37°31'	W106°02'	7605
Petey (LOM/NDB)	CO	407	N38°41'	W104°42'	5570
Skipi (LOM)	FT	321	N39°47'	W104°26'	5407
Trinidad	TAD	329	N37°18'	W104°20'	—

Connecticut

Airports

Bridgeport, CT – Igor Sikorsky Memorial

Ident	BDR	**ATIS**	119.15
Elev	10	**Rwy/Length/ILS/ID**	06/4677/110.7/IBDR
Lat	N41°09'		24/4677
Long	W73°07'		11/4761
			29/4761

Chester, CT – Chester

Ident	3B9	**ATIS**	—
Elev	416	**Rwy/Length**	17/2566
Lat	N41°23'		35/2566
Long	W72°30'		

Danbury, CT – Danbury Muni

Ident	DXR	**ATIS**	—
Elev	457	**Rwy/Length**	08/4422
Lat	N41°22'		26/4422
Long	W73°28'		17/3135
			35/3135

Danielson, CT – Danielson

Ident	5B3	**ATIS**	—
Elev	238	**Rwy/Length**	13/2700
Lat	N41°49'		31/2700
Long	W71°54'		

Hartford, CT – Hartford-Brainard

Ident	HFD	**ATIS**	126.45
Elev	19	**Rwy/Length/ILS/ID**	02/4418/109.7/IFHD
Lat	N41°44'		20/4418
Long	W72°39'		11/2315
			29/2315
			NE/2350 Grass
			SW/2350 Grass

Meriden, CT – Meriden Markham Muni

Ident	MMK	**ATIS**	—
Elev	103	**Rwy/Length**	18/3100
Lat	N41°30'		36/3100
Long	W72°49'		

New Haven, CT – Tweed-New Haven

Ident	HVN	**ATIS**	133.65
Elev	13	**Rwy/Length/ILS/ID**	02/5600/109.1/IHVN
Lat	N41°15'		20/5600
Long	W72°53'		14/3634
			32/3634

Oxford, CT – Waterbury-Oxford

Ident	OXC	**ATIS**	—
Elev	727	**Rwy/Length**	13/1999
Lat	N41°28'		31/1999
Long	W73°08'		18/5000
			36/5000

Willimantic, CT – Windham

Ident	IJD	**ATIS**	—
Elev	247	**Rwy/Length**	09/4278
Lat	N41°44'		27/4278
Long	W72°10'		18/2797
			36/2797

Windsor Locks, CT – Bradley Intl

Ident	BDL	**ATIS**	118.15
Elev	174	**Rwy/Length/ILS/ID**	01/5145
Lat	N41°56'		19/5145
Long	W72°41'		06/9502/111.1/IBDL
			24/9502/111.1/IMYQ
			15/6846
			33/6846/108.55/IKX

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Bradley	VORTAC	BDL	109.00	N41°56'	W72°41'	160
Bridgeport	VOR	BDR	108.80	N41°09'	W73°07'	10
Groton	VOR	TMU	111.80	N41°19'	W72°03'	10
Hartford	VORTAC	HFD	114.90	N41°38'	W72°32'	850
Madison	VOR-DME	MAD	110.40	N41°18'	W72°41'	230
New Haven	VOR-DME	HVN	109.80	N41°15'	W72°53'	10
Norwich	VORTAC	ORW	110.00	N41°33'	W71°59'	310
Putnam	VOR-DME	PUT	117.40	N41°57'	W71°50'	650

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Chupp (LOM)	BD	388	N41°52'	W72°45'	—
Ciera (LOM)	OX	362	N41°24'	W73°07'	—
Lomis (LOM/NDB)	HF	244	N41°38'	W72°37'	45
Meriden	MMK	238	N41°30'	W72°49'	—
Waterbury	TBY	257	N41°31'	W73°08'	—

Deleware

Airports

Wilmington, DE – New Castle County

Ident	ILG	**ATIS**	123.95
Elev	80	**Rwy/Length/ILS/ID**	01/7002/110.30/IILG
Lat	N39°40'		19/7002
Long	W75°36'		09/7165
			27/7165
			14/4594
			32/4594

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Dupont	VORTAC	DQO	114.00	N39°40'	W75°36'	71
Smyrna	VORTAC	ENO	111.40	N39°13'	W75°30'	10
Waterloo	VOR-DME	ATR	112.60	N38°48'	W75°12'	10

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Hadin (LOM)	IL	248	N39°34'	W75°36'	—

Florida

Airports

Cape Canaveral, FL – Cape Canaveral AFS Skip Strip

Ident	XMR	**ATIS**	—
Elev	10	**Rwy/Length/ILS/ID**	—
Lat	N28°28'		
Long	W80°34'		

Cocoa Beach, FL – Patrick AFB

Ident	COF	**ATIS**	119.17
Elev	9	**Rwy/Length/ILS/ID**	02//109.1/ICOF
Lat	N28°14'		20//110.9/IPKC
Long	W80°36'		

Everglades, FL – Everglades

Ident	X01	**ATIS**	—
Elev	5	**Rwy/Length/ILS/ID**	—
Lat	N25°50'		
Long	W81°23'		

Homestead, FL – Homestead AFB

Ident	HST	**ATIS**	—
Elev	7	**Rwy/Length**	—
Lat	N25°29'		
Long	W80°23'		

Homestead, FL – Homestead General (CLOSED)

Ident	X51	**ATIS**	—
Elev	9	**Rwy/Length**	—
Lat	N25°29'		
Long	W80°33'		

Jacksonville, FL – Jacksonville Intl

Ident	JAX	**ATIS**	125.85
Elev	30	**Rwy/Length/ILS/ID**	07/8000/110.70/IJAX
Lat	N30°29'		25/8000/109.10/IPEK
Long	W81°41'		13/7700/108.90/ICZH
			31/7700

Key West, FL – Key West NAS

Ident	NQX	**ATIS**	—
Elev	6	**Rwy/Length**	—
Lat	N24°34'		
Long	W81°41'		

Key West, FL – Key West Intl.

Ident	EYW	**ATIS**	—
Elev	4	**Rwy/Length**	—
Lat	N24°33'		
Long	W81°45'		

Marathon, FL – Marathon

Ident	MTH	**ATIS**	—
Elev	7	**Rwy/Length**	—
Lat	N24°43'		
Long	W81°03'		

Miami, FL – Dade-Collier

Ident	TNT	**ATIS**	—
Elev	14	**Rwy/Length/ILS/ID**	09//108.3/ITNT
Lat	N25°51'		
Long	W80°53'		

Miami, FL – Miami Intl

Ident	MIA	**ATIS**	119.15
Elev	11	**Rwy/Length/ILS/ID**	9R/13000/110.90/IBUL
Lat	N25°47'		27L/13000/109.50/IMIA
Long	W80°17'		9L/10502/110.30/IMFA
			27R/10502/109.10/IVIN
			12/9355/108.90/IGEM
			30/9355/111.70/IDCX

Miami, FL – Opa Locka

Ident	OPF	**ATIS**	125.9
Elev	10	**Rwy/Length/ILS/ID**	09L//110.5/IOPF
Lat	N25°54'		
Long	W80°17'		

Orlando, FL – Orlando Intl

Ident	MCO	**ATIS**	121.25
Elev	96	**Rwy/Length/ILS/ID**	17/10000/111.75/IDIZ
Lat	N28°25'		35/10000/110.50/IDDO
Long	W81°19'		18R/12004/111.90/ITFE
			36L/12004
			18L/12004
			36R/12004/110.70/IOJP

Titusville, FL – Dunn

Ident	X21	**ATIS**	—
Elev	28	**Rwy/Length**	—
Lat	N28°37'		
Long	W80°50'		

Titusville, FL – NASA Shuttle Landing Facility

Ident	X68	**ATIS**	—
Elev	9	**Rwy/Length**	—
Lat	N28°36'		
Long	W80°41'		

Titusville, FL – Space Center Executive

Ident	TIX	**ATIS**	—
Elev	35	**Rwy/Length/ILS/ID**	36//108.7/ITIX
Lat	N28°30'		
Long	W80°48'		

Tallahassee, FL – Tallahassee Muni

Ident	TLH	**ATIS**	119.45
Elev	81	**Rwy/Length/ILS/ID**	09/8000
Lat	N30°23'		27/8000/111.90/IPLQ
Long	W84°20'		18/6065
			36/6065/110.30/ITLH

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Cecil	VOR	VQQ	117.90	N30°12'	W81°53'	70
Craig	VORTAC	CRG	114.50	N30°20'	W81°30'	40
Crestview	VORTAC	CEW	115.90	N30°49'	W86°40'	255
Cross City	VORTAC	CTY	112.00	N29°35'	W83°02'	30
Cypress	VOR-DME	CYY	108.60	N26°09'	W81°46'	10
Dolphin	VORTAC	DHP	113.90	N25°48'	W80°20'	8
Eglin	VOR	VPS	109.80	N30°23'	W86°32'	90
Fort Lauderdale	VOR-DME	FLL	114.40	N26°04'	W80°09'	10
Gainesville	VORTAC	GNV	116.20	N29°34'	W82°21'	60
Greenville	VORTAC	GEF	109.00	N30°33'	W83°46'	220
Key West	VORTAC	EYW	113.50	N24°35'	W81°48'	10
La Belle	VORTAC	LBV	110.40	N26°49'	W81°23'	30
Lakeland	VORTAC	LAL	116.00	N27°59'	W82°00'	130
Lee Co	VORTAC	RSW	111.80	N26°31'	W81°46'	20
Marianna	VORTAC	MAI	114.00	N30°47'	W85°07'	120
Melbourne	VOR-DME	MLB	110.00	N28°06'	W80°38'	30
Miami	VORTAC	MIA	115.90	N25°57'	W80°27'	—
Ocala	VORTAC	OCF	113.70	N29°10'	W82°13'	80
Orlando	VORTAC	ORL	112.20	N28°32'	W81°20'	110
Ormond Beach	VORTAC	OMN	112.60	N29°18'	W81°06'	20
Pahokee	VORTAC	PHK	115.40	N26°46'	W80°41'	20
Palm Beach	VORTAC	PBI	115.70	N26°40'	W80°05'	20
Panama City	VORTAC	PFN	114.30	N30°12'	W85°40'	10
Pompano Beach	VOR	PMP	108.80	N26°14'	W80°06'	20
Punta Gorda	VOR	PGD	110.20	N26°55'	W81°59'	23
Saint Augustine	VOR-DME	SGJ	109.40	N29°57'	W81°20'	10
Saint Petersburg	VORTAC	PIE	116.40	N27°54'	W82°41'	10
Sarasota	VORTAC	SRQ	115.20	N27°23'	W82°33'	20
Saufley	VOR	NUN	108.80	N30°28'	W87°20'	80
Tallahassee	VORTAC	TLH	117.50	N30°33'	W84°22'	180
Taylor	VORTAC	TAY	112.90	N30°30'	W82°33'	140
Vero Beach	VORTAC	VRB	117.30	N27°40'	W80°29'	20
Virginia Key	VOR-DME	VKZ	117.10	N25°45'	W80°09'	92

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Allentown (Navy)	NVK	368	N30°46'	W87°04'	—
Brooksville	BKV	278	N28°28'	W82°26'	—
Caloo (LOM)	FM	341	N26°30'	W81°56'	5
Capok (LOM)	PI	360	N27°59'	W82°42'	39
Cook	CKK	365	N25°47'	W80°20'	7
Cosme (LOM)	TP	368	N28°05'	W82°31'	—
Deland	DED	201	N29°04'	W81°16'	—
Dinns (LOM/NDB)	JA	344	N30°27'	W81°48'	19
Eastport	EYA	357	N30°25'	W81°36'	15
Fish Hook	FIS	332	N24°32'	W81°47'	—
Foley	FPY	254	N29°59'	W83°35'	—
Fort Pierce	FPR	275	N27°29'	W80°22'	24
Geiger Lake	GGL	375	N28°35'	W80°48'	—
Greenville	GRE	233	N38°50'	W89°22'	220
Herlong	HEG	332	N30°16'	W81°48'	—
Herny (LOM)	OR	221	N28°30'	W81°26'	—
Jumpi (LOM)	OC	423	N29°03'	W82°13'	75
Keyes (LOM)	MI	248	N25°47'	W80°11'	—

Location/Name	Ident	Freq	Lat	Long	Elev
Kissimmee	ISM	329	N28°17'	W81°26'	82
Knight	TPF	270	N27°54'	W82°27'	7
Kobra (LOM)	CE	201	N30°51'	W86°32'	255
Lake City	LCQ	204	N30°11'	W82°34'	200
Lakeland	LQL	263	N41°40'	W81°22'	130
Lynne (LOM)	PF	278	N30°19'	W85°46'	—
Marathon	MTH	260	N24°42'	W81°05'	—
Marco	MKY	375	N25°59'	W81°40'	152
Monry (LOM)	TN	227	N25°51'	W81°00'	—
Muffe (LOM)	RS	336	N26°29'	W81°50'	—
Naples	APF	201	N26°09'	W81°46'	—
New Smyrna Beach	EVB	417	N29°03'	W80°56'	12
Palatka	IAK	243	N29°39'	W81°48'	90
Pickens	PKZ	326	N30°26'	W87°10'	—
Picny (LOM/NDB)	AM	388	N27°51'	W82°32'	—
Plant City	PCM	346	N28°00'	W82°09'	134
Plantation	PJN	242	N26°07'	W80°13'	—
Praiz (LOM/NDB)	FX	221	N26°11'	W80°17'	15
Qeezy (LOM)	TM	266	N25°38'	W80°30'	8
Ringy (LOM)	SRI	245	N27°19'	W82°28'	—
Rubin (LOM/NDB)	PB	356	N26°41'	W80°12'	—
Sanford	SFB	408	N28°47'	W81°14'	—
Satellite	SQT	257	N28°05'	W80°42'	—
Sebring	SEF	382	N27°27'	W81°20'	119
Soyya	SMY	329	N30°52'	W85°13'	—
Tomok (LOM)	DA	263	N29°08'	W81°08'	47
Tri Co	BKK	275	N30°51'	W85°36'	—
Venice	VNC	206	N27°03'	W82°25'	19
Vero Beach	VEP	392	N27°39'	W80°25'	20
Wakul (LOM/NDB)	TL	379	N30°19'	W84°21'	—
Wirey (LOM)	LA	227	N27°56'	W82°04'	100
Wynds (LOM/NDB)	GN	269	N29°40'	W82°10'	—
Zephyrhills	RHZ	253	N28°13'	W82°09'	80

Georgia

Airports

Atlanta, GA – Hartsfield Intl

Ident	ATL	**ATIS**	125.55
Elev	1026	**Rwy/Length/ILS/ID**	8R/10000/109.90/IATL
Lat	N33°38'		26L/10000/108.70/IBRU
Long	W84°25'		8L/9000/109.30/IHFW
			26R/9000/110.10/IGXZ
			9R/9000/108.90/IFUN
			27L/9000/108.50/IFSQ
			9L/11889/110.50/IHZK
			27R/11889/111.30/IAFA

Atlanta, GA – Peachtree City-Falcon

Ident	FFC	**ATIS**	—
Elev	808	**Rwy/Length/ILS/ID**	31//111.95/IFFC
Lat	N33°21'		
Long	W84°34'		

Atlanta/Dekalb, GA – Peachtree

Ident	PDK	**ATIS**	128.4
Elev	1002	**Rwy/Length/ILS/ID**	20L//111.1/IPDK
Lat	N33°52'		
Long	W84°18'		

Atlanta/Fulton Co., GA – Brown

Ident	FTY	**ATIS**	120.17
Elev	841	**Rwy/Length/ILS/ID**	08//109.1/IFTY
Lat	N33°46'		
Long	W84°31'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Alma	VORTAC	AMG	115.10	N31°32'	W82°30'	200
Athens	VORTAC	AHN	109.60	N33°56'	W83°19'	790
Atlanta	VORTAC	ATL	116.90	N33°37'	W84°26'	1000
Brunswick	VORTAC	SSI	109.80	N31°03'	W81°26'	10
Columbus	VORTAC	CSG	117.10	N32°36'	W85°01'	630
Dublin	VORTAC	DBN	113.10	N32°33'	W82°49'	300
Foothills	VORTAC	ODF	113.40	N34°41'	W83°17'	1700
Harris	VORTAC	HRS	109.80	N34°56'	W83°54'	3660
Hunter	VOR	SVN	111.60	N32°00'	W81°08'	40
La Grange	VORTAC	LGC	115.60	N33°02'	W85°12'	790
Lawson	VOR	LSF	111.40	N32°19'	W84°59'	260
Macon	VORTAC	MCN	114.20	N32°41'	W83°38'	350
Moultrie	VOR-DME	MGR	108.80	N31°04'	W83°48'	291
Peachtree	VOR-DME	PDK	116.60	N33°52'	W84°17'	970
Pecan	VORTAC	PZD	116.10	N31°39'	W84°17'	280
Rome	VORTAC	RMG	115.40	N34°09'	W85°07'	1150
Savannah	VORTAC	SAV	112.70	N32°09'	W81°06'	10
Tift Myers	VOR	IFM	112.50	N31°25'	W83°29'	351
Valdosta	VOR-DME	OTK	114.80	N30°46'	W83°16'	200
Vienna	VORTAC	VNA	116.50	N32°12'	W83°29'	300
Waycross	VORTAC	AYS	110.20	N31°16'	W82°33'	150

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Alcovy	VOF	370	N33°37'	W83°46'	658
Barrow Co	BMW	404	N33°56'	W83°35'	810
Bay Creek	BEP	350	N32°27'	W83°45'	60
Bulldog	BJT	221	N33°57'	W83°13'	738
Bullock Co	IBU	407	N32°24'	W81°39'	125
Burke Co	BXG	356	N33°02'	W82°00'	295
Bushe (LOM)	AG	233	N33°17'	W81°56'	300
Caidy	CYR	338	N30°53'	W84°09'	245
Calhoun	OUK	323	N34°24'	W84°55'	695
Camilla	CXU	369	N31°12'	W84°14'	—
Canton	DJD	415	N34°15'	W84°29'	1100
Carrollton	GPQ	239	N33°33'	W85°07'	1000
Cartersville	EVZ	308	N34°11'	W84°50'	773
Catta (LOM)	AT	375	N33°38'	W84°32'	956
Coffee Co	OWC	390	N31°24'	W82°55'	260
Commerce	DDA	244	N34°03'	W83°31'	880
Coney	OHY	400	N31°59'	W83°51'	340
Coweta Co	EQQ	234	N33°15'	W84°42'	—
Culvr	ML	380	N33°09'	W83°09'	385
Donaldsonville	ONG	352	N31°00'	W84°52'	146
Eastman	EZM	270	N32°12'	W83°07'	300
Emanuel Co	EEX	309	N32°40'	W82°27'	256
Emory	EMR	385	N33°27'	W81°59'	424
Fenix (LOM)	CS	355	N32°27'	W85°02'	368
Fitzgerald	SUR	362	N31°36'	W83°17'	385
Flanc (LOM/NDB)	FT	344	N33°45'	W84°38'	900
Flowery Branch	FKV	365	N34°12'	W83°54'	1135
Floyd	OYD	388	N34°17'	W85°09'	—
Greensboro	EJK	397	N33°35'	W83°08'	662
Gwnet (LOM/NDB)	TX	419	N34°01'	W83°51'	984
Habersham	AJR	347	N34°30'	W83°32'	—
Hazlehurst	AZE	414	N31°52'	W82°38'	240
Homerville	HOE	209	N31°03'	W82°46'	180
Jeffi (LOM)	BQ	275	N31°13'	W81°32'	10
Kaolin	OKZ	212	N32°57'	W82°50'	430
Lawson	AWS	335	N32°17'	W85°01'	—
Lindbergh	LKG	242	N32°10'	W84°06'	475
Louvale	XLE	407	N32°09'	W84°50'	—
Mavis (LOM)	SA	368	N32°07'	W81°19'	—
Mc Duffie	THG	341	N33°31'	W82°26'	490
Mc Intosh	MOQ	263	N31°49'	W81°30'	—
Mc Rae	MQW	280	N32°05'	W82°53'	205
Metter	MHP	432	N32°22'	W82°05'	193
Monroe	JNM	429	N33°44'	W83°43'	820
Montezuma	IZS	426	N32°22'	W84°00'	435
Onyun	UQN	372	N32°13'	W82°17'	152
Patten	GTP	245	N30°57'	W83°49'	245
Pecat (LOM/NDB)	FF	316	N33°18'	W84°29'	850
Pickens Co	JZP	285	N34°27'	W84°27'	1535
Pine Mountain	PIM	272	N32°50'	W84°52'	—
Prison	RVJ	424	N32°03'	W82°09'	—
Putny (LOM/NDB)	AB	227	N31°27'	W84°16'	—
Redan (LOM/NDB)	BR	266	N33°38'	W84°18'	834
Slover	JES	340	N31°33'	W81°53'	95
Sofke (LOM)	MC	290	N32°38'	W83°42'	—
Sylvania	JYL	245	N32°38'	W81°35'	181
Tifto (LOM)	TM	409	N31°21'	W83°26'	293
Turkey Creek	UPK	251	N32°29'	W83°00'	275
Washington-Wilkes Co.	IIY	435	N33°46'	W82°48'	651
Wassa (LOM)	SV	335	N32°00'	W80°59'	—
Whitfield	UWI	400	N34°47'	W84°56'	705
Willis	LYZ	359	N30°58'	W84°31'	130

Hawaii

Airports

Honolulu, HI – Honolulu Intl

Ident	HNL	**ATIS**	127.90
Elev	13	**Rwy/Length/ILS/ID**	08L/12357/109.50/IHNL
Lat	N21°19'		26R/12357
Long	W157°54'		08R/12000
			26L/12000/109.10/IEPC
			4L/6952
			22R/6952
			4R/9000/110.50/IIUM
			22L/9000

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Hilo	VORTAC	ITO	116.90	N19°43'	W155°00'	23
Honolulu	VORTAC	HNL	114.80	N21°18'	W157°55'	10
Kamuela	VOR-DME	MUE	113.30	N19°59'	W155°40'	2670
Koko Head	VORTAC	CKH	113.90	N21°15'	W157°42'	640
Kona	VORTAC	IAI	115.70	N19°39'	W156°01'	50
Lanai City	VORTAC	LNY	117.70	N20°45'	W156°58'	1250
Lihue	VORTAC	LIH	113.50	N21°57'	W159°20'	110
Maui	VORTAC	OGG	114.30	N20°53'	W156°25'	30
Midway	TACAN	NQM	114.60	N28°12'	W177°22'	16
Molokai	VORTAC	MKK	116.10	N21°08'	W157°10'	1421
South Kauai	VORTAC	SOK	115.40	N21°54'	W159°31'	630
Upolu Point	VORTAC	UPP	112.30	N20°12'	W155°50'	1760

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Bradshaw	BSF	339	N19°45'	W155°35'	—
Ewabe (LOM/NDB)	HN	242	N21°19'	W158°02'	—
Kaneohe Bay	NGF	265	N21°27'	W157°45'	47
Lanai	LLD	353	N20°46'	W156°57'	—
Valley Island	VYI	327	N20°52'	W156°26'	—

Idaho

Airports

Boise, ID – Boise Air Terminal – Gowen

Ident	BOI	**ATIS**	123.90
Elev	2858	**Rwy/Length/ILS/ID**	10R/9763/108.50/IBOI
Lat	N43°33'		28L/9763
Long	W116°13'		10L/7400
			28R/7400

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Boise	VORTAC	BOI	113.30	N43°33'	W116°11'	2870
Burley	VORTAC	BYI	114.10	N42°34'	W113°51'	4230
Coeur D' Alene	VOR-DME	COE	108.80	N47°46'	W116°49'	2290
Donnelly	VORTAC	DNJ	116.20	N44°46'	W116°12'	7300
Dubois	VORTAC	DBS	116.90	N44°05'	W112°12'	4920
Idaho Falls	VOR-DME	IDA	109.00	N43°31'	W112°03'	4720
Malad City	VOR-DME	MLD	117.40	N42°11'	W112°27'	7330
Mountain Home	VOR	MUO	114.90	N42°58'	W115°46'	2990
Mullan Pass	VOR-DME	MLP	117.80	N47°27'	W115°38'	6100
Nez Perce	VOR-DME	MQG	108.20	N46°22'	W116°52'	1720
Pocatello	VORTAC	PIH	112.60	N42°52'	W112°39'	4430
Salmon	VOR-DME	LKT	113.50	N45°01'	W114°05'	9258
Twin Falls	VORTAC	TWF	115.80	N42°28'	W114°29'	4140

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Bear Lake	BBH	233	N42°15'	W111°20'	—
Challis	LLJ	397	N44°31'	W114°12'	5030
Council	CQI	274	N44°45'	W116°26'	2945
Grain	GVV	280	N45°56'	W116°13'	—
Hailey	HLE	220	N43°19'	W114°14'	4950
Leeny (LOM)	CO	347	N47°44'	W116°57'	2153
Mc Call	IOM	363	N44°48'	W116°06'	4912
Sandpoe	SZT	264	N48°17'	W116°33'	—
Steelhead	HDG	211	N42°54'	W114°40'	3622
Strik (LOM)	TW	389	N42°28'	W114°21'	4065
Sturgeon	STI	333	N43°06'	W115°40'	3130
Sweden	SWU	350	N43°25'	W112°09'	—
Tyhee (LOM)	PI	383	N42°57'	W112°30'	—
Uconn (LOM)	ID	324	N43°35'	W111°58'	4794
Ustik (LOM/NDB)	BO	359	N43°35'	W116°18'	2700

Illinois

Airports

Alton/St. Louis, IL – St. Louis Regl.

Ident	ALN	**ATIS**	128.0
Elev	544	**Rwy/Length/ILS/ID**	29//108.5/IALN
Lat	N38°53'		
Long	W90°02'		

Bloomington/Normal, IL – Bloomington/Normal

Ident	BMI	**ATIS**	135.35
Elev	875	**Rwy/Length/ILS/ID**	03/3723
Lat	N40°28'		21/3723
Long	W88°55'		11/6500
			29/6500/108.3/IBMI

Champaign/Urbana, IL – Univ of IL-Willard

Ident	CMI	**ATIS**	124.85
Elev	754	**Rwy/Length/ILS/ID**	04L/6500
Lat	N40°02'		22R/6500
Long	W88°16'		14R/8100
			32L/8100/109.10/ICMI
			18/5299
			36/5299

Chicago/Aurora – Aurora Muni

Ident	ARR	**ATIS**	—
Elev	707	**Rwy/Length/ILS/ID**	09/6500/108.9/IARR
Lat	N41°46'		27/6500
Long	W88°28'		18/3199
			36/3199

Chicago,IL – Chicago Midway

Ident	MDW	**ATIS**	132.75
Elev	619	**Rwy/Length/ILS/ID**	4R/6446/111.5/IHKH
Lat	N41°47'		22L/6446
Long	W87°45'		4L/5509
			22R/5509
			13R/3859
			31L/3859
			13C/6521/109.9/IMDW
			31C/6521/109.9/IMXT
			13L/5141
			31R/5141

Chicago, IL – Chicago O'Hare Intl

Ident	ORD	**ATIS**	135.40
Elev	668	**Rwy/Length/ILS/ID**	4R/8071/110.10/IFJU
Lat	N41°59'		22L//110.10/ILQQ
Long	W87°54'		4L/7500/111.30/IHNA
			22R/7500/111.30/IRXZ
			9R//111.10/IMED
			27L/10141/111.10/ITSL
			9L//110.50/IJAV
			27R/7966/110.50/IIAC
			14R/13000/109.75/IORD
			32L/13000/108.95/IRVG
			14L/10003/110.90/IOHA
			32R/10003/110.75/IIDN
			18/5341
			36/5341

Chicago, IL – Lansing Muni

Ident	3HA	**ATIS**	—
Elev	616	**Rwy/Length**	09/3658
Lat	N41°32'		27/3658
Long	W87°31'		18/2322 Grass
			36/2322 Grass

Chicago/Schaumburg – Schaumburg Air Park

Ident	06C	**ATIS**	—
Elev	797	**Rwy/Length**	10/3000
Lat	N41°59'		28/3000
Long	W88°06'		

Chicago, IL – Dupage

Ident	DPA	**ATIS**	124.8
Elev	758	**Rwy/Length/ILS/ID**	1L/5100/111.7/IGVK
Lat	N41°54'		19R/5100
Long	W88°15'		1R/3300
			19L/3300
			10/4750/109.5/IDPA
			28/4750
			15/3401
			33/3401

Chicago, IL – Meigs

Ident	CGX	**ATIS**	127.35
Elev	593	**Rwy/Length**	18/3947
Lat	N51°31'		36/3947
Long	W87°36'		

Chicago/Prospect Heights/Wheeling – Palwaukee Municipal

Ident	PWK	**ATIS**	124.2
Elev	647	**Rwy/Length/ILS/ID**	16//111.9/IPWK
Lat	N42°06'		
Long	W87°54'		

Chicago/Romeoville, IL – Lewis Univ

Ident	LOT	**ATIS**	—
Elev	668	**Rwy/Length**	09/4000
Lat	N41°36'		27/4000
Long	W88°05'		06/2400 Grass
			24/2400 Grass

Chicago/Waukegan, IL – Waukegan Regional

Ident	UGN	**ATIS**	132.4
Elev	727	**Rwy/Length/ILS/ID**	23//110.7/IUGN
Lat	N42°25'		
Long	W87°52'		

Danville, IL – Vermilion County

Ident	DNV	**ATIS**	—
Elev	696	**Rwy/Length/ILS/ID**	03/5399
Lat	N40°12'		21/5399/108.5/IDNV
Long	W87°35'		16/3999
			34/3999
			12/2500 Grass
			30/2500 Grass

Dwight, IL – Dwight

Ident	DTG	**ATIS**	—
Elev	632	**Rwy/Length**	09/2368 Grass
Lat	N41°07'		27/2368 Grass
Long	W88°26'		18/2000 Grass
			36/2000 Grass

Frankfort, IL – Frankfort

Ident	C18	**ATIS**	—
Elev	778	**Rwy/Length**	—
Lat	N41°28'		
Long	W87°50'		

Gibson City, IL – Gibson City Muni

Ident	C34	**ATIS**	—
Elev	758	**Rwy/Length**	09/2400 Grass
Lat	N40°29'		27/2400 Grass
Long	W88°16'		18/3400
			36/3400

Glenview, IL – Glenview NAS

Ident		**ATIS**	—
Elev	653	**Rwy/Length**	—
Lat	N42°05'		
Long	W87°49'		

Grayslake, IL – Campbell

Ident	C81	**ATIS**	—
Elev	788	**Rwy/Length**	—
Lat	N42°19'		
Long	W88°04'		

Greenwood/Wonder Lake, IL – Galt

Ident	10C	**ATIS**	—
Elev	875	**Rwy/Length**	—
Lat	N42°24'		
Long	W88°22'		

Joliet, IL – Joliet Park District

Ident	JOT	**ATIS**	—
Elev	582	**Rwy/Length**	12/2970
Lat	N41°31 '		30/2970
Long	W88°10'		04/3452 Grass
			22/3452 Grass

Kankakee, IL – Greater Kankakee

Ident	IKK	**ATIS**	—
Elev	630	**Rwy/Length/ILS/ID**	04/5985/108.7/IIKK
Lat	N41°04'		22/5985
Long	W87°50'		16/4400
			34/4400

Lake in the Hills, IL – Lake in the Hills

Ident	3CK	**ATIS**	—
Elev	886	**Rwy/Length**	—
Lat	N42°12'		
Long	W88°19'		

Monee, IL – Sanger

Ident	C56	**ATIS**	—
Elev	790	**Rwy/Length**	05/2313
Lat	N41°22'		23/2313
Long	W87°40'		09/2412
			27/2412

Morris, IL – Morris Muni-James R. Washburn

Ident	C09	**ATIS**	—
Elev	584	**Rwy/Length**	18/4000
Lat	N41°25'		36/4000
Long	W88°25'		

New Lenox, IL – Howell-New Lenox

Ident	1C2	**ATIS**	—
Elev	753	**Rwy/Length**	05/2103
Lat	N41°28'		23/2103
Long	W87°55'		13/2857
			31/2857

Paxton, IL – Paxton

Ident	1C1	**ATIS**	—
Elev	779	**Rwy/Length**	18/3409
Lat	N40°26'		36/3409
Long	W88°07'		

Plainfield, IL – Clow Intl

Ident	1C5	**ATIS**	—
Elev	670	**Rwy/Length**	18/3370
Lat	N41°41'		36/3370
Long	W88°07'		

Urbana, IL – Frasca Field

Ident	C16	**ATIS**	—
Elev	735	**Rwy/Length**	09/4000
Lat	N40°08'		27/4000
Long	W88°12'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Bible Grove	VORTAC	BIB	109.00	N38°55'	W88°28'	540
Bloomington	VOR-DME	BMI	108.20	N40°28'	W88°55'	880
Bradford	VORTAC	BDF	114.70	N41°09'	W89°35'	810
Capital	VORTAC	CAP	112.70	N39°53'	W89°37'	590
Centralia	VORTAC	ENL	115.00	N38°25'	W89°09'	550
Champaign	VORTAC	CMI	110.00	N40°02'	W88°16'	750
Chicago Heights	VORTAC	CGT	114.20	N41°30'	W87°34'	630
Chicago-Ohare	VOR-DME	ORD	113.90	N41°59'	W87°54'	650
Danville	VORTAC	DNV	111.00	N40°17'	W87°33'	700
Decatur	VORTAC	DEC	117.20	N39°44'	W88°51'	700
Dupage	VOR-DME	DPA	108.40	N41°53'	W88°21'	800
Galesburg	VOR-DME	GBG	109.80	N40°56'	W90°26'	760
Jacksonville	VOR-DME	IJX	108.60	N39°46'	W90°14'	615
Joliet	VORTAC	JOT	112.30	N41°32'	W88°19'	590
Kankakee	VOR	IKK	111.60	N41°04'	W87°50'	618

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Lawrenceville	VOR-DME	LWV	113.50	N38°46'	W87°35'	429
Marion	VOR-DME	MWA	110.40	N37°45'	W89°00'	490
Mattoon	VOR-DME	MTO	109.40	N39°28'	W88°17'	720
Moline	VORTAC	MZV	114.40	N41°19'	W90°38'	820
Mount Vernon	VOR-DME	VNN	113.80	N38°21'	W88°48'	555
Northbrook	VORTAC	OBK	113.00	N42°13'	W87°57'	710
Peoria	VORTAC	PIA	115.20	N40°40'	W89°47'	730
Peotone	VORTAC	EON	113.20	N41°16'	W87°47'	690
Polo	VORTAC	PLL	111.20	N41°57'	W89°31'	840
Pontiac	VORTAC	PNT	109.60	N40°49'	W88°44'	680
Quincy	VORTAC	UIN	113.60	N39°50'	W91°16'	710
Roberts	VORTAC	RBS	116.80	N40°34'	W88°09'	780
Rockford	VORTAC	RFD	110.80	N42°13'	W89°11'	860
Samsville	VOR-DME	SAM	116.60	N38°29'	W88°05'	540
Troy	VORTAC	TOY	116.00	N38°44'	W89°55'	570
Vandalia	VORTAC	VLA	114.30	N39°05'	W89°09'	610

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Abraham	AAA	329	N40°09'	W89°20'	592
Alpos (LOM)	AL	218	N38°51'	W89°56'	—
Belleville	BL	362	N38°27'	W89°45'	419
Bellgrade	BDD	254	N37°08'	W88°40'	388
Benton	BEE	414	N38°00'	W88°55'	445
Cabbi (LOM)	MD	388	N37°52'	W89°14'	411
Cahokia	CPS	375	N38°34'	W90°09'	413
Cairo	CIR	397	N37°03'	W89°13'	318
Canton	CTK	236	N40°33'	W90°04'	715
Carmi	CUL	332	N38°05'	W88°07'	384
Casey	CZB	359	N39°18'	W88°00'	643
Civic Memorial	CVM	263	N38°53'	W90°03'	—
Deana (LOM/NDB)	ME	350	N41°58'	W88°01'	—
Dekalb	DKB	209	N41°55'	W88°42'	911
Dwight	DTG	344	N41°08'	W88°26'	624
Elm River	FOA	353	N38°40'	W88°27'	—
Elwin (LOM)	DE	275	N39°47'	W88°57'	—
Ermin (LOM/NDB)	HK	332	N41°43'	W87°50'	691
Freeport	FEP	335	N42°14'	W89°35'	—
Gilmy (LOM)	RF	275	N42°06'	W89°05'	—
Harrisburg/Raleigh	HSB	230	N37°48'	W88°32'	397
Homer	HMJ	281	N40°01'	W87°57'	—
Huskk (LOM/NDB)	SP	382	N39°46'	W89°45'	—
Jocky (LOM)	RV	257	N41°53'	W87°49'	—
Jonny (LOM)	MW	382	N37°50'	W88°58'	390
Kedzi (LOM/NDB)	MX	248	N41°44'	W87°41'	623
Kewanee	EZI	245	N41°12'	W89°57'	856
Leama (LOM)	OH	368	N42°04'	W87°59'	—
Macomb	JZY	251	N40°31'	W90°33'	622
Metropolis	MIX	281	N37°11'	W88°45'	—
Molli (LOM)	ML	215	N41°26'	W90°37'	578
Mount Carmel	AJG	524	N38°36'	W87°43'	—
Olney	OLY	272	N38°43'	W88°10'	470
Ottawa	OIX	266	N41°21'	W88°51'	—
Palestine	PLX	391	N39°00'	W87°38'	—
Paris	PRG	341	N39°41'	W87°40'	655
Pittsfield	PPQ	344	N39°38'	W90°46'	702
Quincy (LOM/NDB)	UI	293	N39°53'	W91°15'	—
Roamy (LOM)	OR	394	N42°03'	W88°00'	693
Salem	SLO	400	N38°38'	W88°58'	—
Shelbyville	SYZ	365	N39°24'	W88°50'	810
Sparta	SAR	239	N38°08'	W89°42'	532
Taffs (LOM)	IA	414	N41°59'	W87°47'	—
Taylorville	TAZ	395	N39°32'	W89°19'	613
Tungg (LOM/NDB)	PI	356	N40°36'	W89°35'	—
Valley	VYS	230	N41°21'	W89°08'	652
Veals (LOM)	CM	407	N39°57'	W88°10'	—
Wauke (LOM)	UG	379	N42°27'	W87°48'	—
Wayne Co	FWC	257	N38°22'	W88°24'	421
Whiteside	BOZ	254	N41°42'	W89°47'	934
Zebre (LOM/NDB)	MT	347	N39°26'	W88°10'	575

Indiana

Airports

Gary, IN – Gary Regional

Ident	GYY	**ATIS**	125.6
Elev	591	**Rwy/Length/ILS/ID**	30//108.3/IGYY
Lat	N41°00'		
Long	W87°24'		

Griffith, IN – Merrillville

Ident	05C	**ATIS**	—
Elev	634	**Rwy/Length**	—
Lat	N41°31'		
Long	W87°24'		

Indianapolis, IN – Indianapolis Intl

Ident	IND	**ATIS**	124.4
Elev	797	**Rwy/Length/ILS/ID**	5L/10005/109.30/IIND
Lat	N39°43'		23R/10005/110.90/IUZK
Long	W86°17'		5R/10000/111.15/IOQV
			23L/10000/111.75/IFVJ
			14/7604/110.50/IBJP
			32/7604/110.50/ICOA

Lowell, IN – Lowell

Ident	C97	**ATIS**	—
Elev	675	**Rwy/Length**	—
Lat	N41°13'		
Long	W87°30'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Boiler	VORTAC	BVT	115.10	N40°33'	W87°04'	750
Fort Wayne	VORTAC	FWA	117.80	N40°58'	W85°11'	800
Goshen	VORTAC	GSH	113.70	N41°31'	W86°01'	850
Grissom	VORTAC	GUS	116.50	N40°38'	W86°09'	810
Hoosier	VORTAC	OOM	110.20	N39°08'	W86°36'	850
Huntingburg	VOR-DME	HNB	109.20	N38°15'	W86°57'	530
Indianapolis	VORTAC	VHP	116.30	N39°48'	W86°22'	870
Knox	VORTAC	OXI	115.60	N41°19'	W86°38'	690
Kokomo	VORTAC	OKK	109.80	N40°31'	W86°03'	830
Marion	VOR-DME	MZZ	108.60	N40°29'	W85°40'	850
Muncie	VOR-DME	MIE	114.40	N40°14'	W85°23'	940
Nabb	VORTAC	ABB	112.40	N38°35'	W85°38'	710
Pocket City	VORTAC	PXV	113.30	N37°55'	W87°45'	430
Richmond	VORTAC	RID	110.60	N39°45'	W84°50'	1135
Shelbyville	VORTAC	SHB	112.00	N39°37'	W85°49'	810
Terre Haute	VORTAC	TTH	115.30	N39°29'	W87°14'	610
Wolf Lake	VOR	OLK	110.40	N41°14'	W85°29'	970

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Airpa (LOM)	EY	209	N39°55'	W86°14'	882
Angola	ANQ	347	N41°38'	W85°05'	—
Balil (LOM)	JN	365	N40°10'	W85°19'	980
Bedford	BFR	344	N38°50'	W86°26'	720
Brinn (LOM)	OQ	219	N39°37'	W86°24'	710
Captain	EQZ	308	N38°52'	W85°58'	592
Claye (LOM/NDB)	BM	382	N39°03'	W86°35'	761
Clifs (LOM/NDB)	BA	410	N39°19'	W85°49'	700
Colfa (LOM)	CO	232	N39°39'	W86°11'	—
Crawfordsville	CFJ	388	N39°58'	W86°54'	803
Culver	CPB	391	N41°13'	W86°23'	—
Earle (LOM)	LA	401	N40°25'	W87°03'	670
Evansville	PDW	284	N38°02'	W87°31'	382
Ferdinand	FNZ	239	N38°14'	W86°50'	550
Garie (LOM)	GY	236	N41°34'	W87°19'	—
Greencastle	TVX	521	N39°42'	W86°48'	825
Greenwood	HFY	318	N39°37'	W86°05'	818
Happs (LOM)	JV	331	N38°28'	W85°44'	525
Hoagy (LOM)	FW	251	N40°55'	W85°07'	—
Huntington	HHG	417	N40°51'	W85°27'	808
Larez (LOM)	FV	349	N39°47'	W86°11'	710
Logansport	GGP	263	N40°42'	W86°22'	732
Madison	IMS	404	N38°45'	W85°27'	874
Metropolitan	UMP	338	N39°56'	W86°03'	788
Michigan City	MGC	203	N41°42'	W86°48'	—
Misha (LOM)	SB	341	N41°42'	W86°13'	—
New Castle	UWL	385	N39°52'	W85°19'	—
North Vernon	OVO	374	N39°02'	W85°36'	—
Oranj	RRJ	368	N38°31'	W86°31'	615
Portland	PLD	257	N40°27'	W84°59'	—
Pully (LOM/NDB)	IN	266	N39°38'	W86°23'	682
Rensselaer	RZL	362	N40°56'	W87°11'	—
Rochester	RCR	216	N41°03'	W86°11'	786
Sedly (LOM/NDB)	VP	212	N41°27'	W86°52'	—
Sullivan	SIV	326	N39°06'	W87°26'	—
Tell City	TEL	206	N38°00'	W86°41'	663
Vicci (LOM)	EV	219	N38°07'	W87°26'	440
Video (LOM/NDB)	AI	371	N40°04'	W85°30'	970
Vincennes	OEA	251	N38°41'	W87°33'	414
Wabash	IWH	329	N40°45'	W85°47'	—
Washington	DCY	212	N38°41'	W87°07'	471
White Co	MCX	377	N40°42'	W86°45'	676
Winamac	RWN	335	N41°05'	W86°36'	707
Winchester	AWW	212	N40°10'	W84°55'	1110
Yinno (LOM/NDB)	HU	245	N39°23'	W87°23'	—
Zionsville	HZP	248	N39°56'	W86°14'	885

Iowa

Airports

Sioux City, IA – Sioux Gateway

Ident	SUX	**ATIS**	119.45
Elev	1098	**Rwy/Length/ILS/ID**	13/8999/111.30/IOIQ
Lat	N42°24'		31/8999/109.30/ISUX
Long	W96 23		17/6599
			35/6599

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Cedar Rapids	VORTAC	CID	114.10	N41°53'	W91°47'	870
Davenport	VORTAC	CVA	113.80	N41°42'	W90°29'	760

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Des Moines	VORTAC	DSM	117.50	N41°26'	W93°38'	940
Dubuque	VORTAC	DBQ	115.80	N42°24'	W90°42'	1060
Elmwood	VOR	EMD	111.00	N42°06'	W92°54'	992
Estherville	VOR	EST	110.40	N43°24'	W94°44'	1320
Fort Dodge	VORTAC	FOD	113.50	N42°36'	W94°17'	1150
Iowa City	VORTAC	IOW	116.20	N41°31'	W91°36'	770
Lamoni	VORTAC	LMN	116.70	N40°35'	W93°58'	1140
Mason City	VORTAC	MCW	114.90	N43°05'	W93°19'	1210
Newton	VOR-DME	TNU	112.50	N41°47'	W93°06'	980
Ottumwa	VORTAC	OTM	111.60	N41°01'	W92°19'	820
Port City	VOR-DME	RTY	108.80	N41°22'	W91°08'	538
Sheldon	VOR-DME	DDL	108.60	N43°12'	W95°50'	1420
Sioux City	VORTAC	SUX	116.50	N42°20'	W96°19'	1080
Spencer	VOR-DME	SPW	110.00	N43°09'	W95°12'	1330
Waterloo	VORTAC	ALO	112.20	N42°33'	W92°23'	865
Waukon	VORTAC	UKN	116.60	N43°16'	W91°32'	1300

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Algona	AXA	403	N43°04'	W94°16'	1210
Ames	AMW	275	N41°59'	W93°37'	929
Atlantic	AIO	365	N41°24'	W95°02'	1153
Audubon	ADU	266	N41°41'	W94°54'	1320
Auney (LOM)	DV	353	N41°41'	W90°39'	748
Barro (LOM)	FO	341	N42°30'	W94°18'	1149
Bloomfield	BEX	269	N40°44'	W92°25'	850
Boone	BNW	407	N42°03'	W93°51'	1143
Burns (LOM)	BR	390	N40°39'	W91°07'	575
Carroll	CIN	397	N42°02'	W94°47'	1202
Centerville	TVK	290	N40°41'	W92°53'	1020
Chariton	CNC	209	N41°01'	W93°21'	1050
Charles City	CCY	375	N43°04'	W92°36'	1130
Chukk	IY	417	N43°08'	W92°43'	1063
Cindy (LOM)	CI	326	N41°53'	W91°48'	—
Clarinda	ICL	353	N40°43'	W95°01'	988
Clarion	CAV	387	N42°44'	W93°45'	1152
Clinton	CWI	377	N41°49'	W90°19'	710
Corning	CRZ	296	N40°59'	W94°45'	1245
Cresco	CJJ	293	N43°21'	W92°07'	1265
Decorah	DEH	347	N43°16'	W91°44'	1137
Denison	DNS	350	N41°59'	W95°22'	1290
Eagle Grove	EAG	302	N42°42'	W93°54'	1128
Emmetsburg	EGQ	410	N43°06'	W94°42'	1200
Fairfield	FFL	332	N41°00'	W91°59'	778
Forem (LOM)	DS	344	N41°28'	W93°34'	—
Forest City	FXY	359	N43°14'	W93°37'	1197
Garrison	VTI	338	N42°13'	W92°01'	825
Greenfield	GFZ	338	N41°19'	W94°26'	1359
Grinnell	GGI	248	N41°42'	W92°43'	995
Guthrie Center	GCT	518	N41°40'	W94°25'	1277
Hampton	HPT	230	N42°43'	W93°13'	1164
Harlan	HNR	272	N41°34'	W95°20'	1200
Hawkeye	UOC	524	N41°37'	W91°32'	648
Hillz (LOM)	FN	517	N41°45'	W90°23'	631
Iowa Falls	IFA	368	N42°28'	W93°15'	1132
Jefferson	EFW	391	N42°00'	W94°20'	1041
Keokuk	EOK	366	N40°27'	W91°26'	671
Knoxville	OXV	284	N41°17'	W93°06'	920
Le Mars	LRJ	382	N42°46'	W96°11'	1190
Little Sioux	LTU	326	N43°07'	W95°07'	1312
Mapleton	MEY	335	N42°10'	W95°47'	1250
Maquoketa	OQW	386	N42°03'	W90°44'	765
Marshalltown	MIW	239	N42°06'	W92°55'	974
Merle (LOM)	IA	362	N41°54'	W93°39'	1022
Monticello	MXO	397	N42°12'	W91°08'	—
Mount Pleasant	MPZ	212	N40°56'	W91°30'	—
Muscatine	MUT	272	N41°21'	W91°08'	547
Oelwein	OLZ	260	N42°41'	W91°58'	—
Orange City	ORC	521	N42°59'	W96°03'	1414
Oskaloosa	OOA	414	N41°13'	W92°29'	—
Pella	PEA	257	N41°24'	W92°56'	—
Perry	PRO	251	N41°49'	W94°09'	1014
Pilot Rock	CKP	423	N42°43'	W95°33'	1220
Pocahontas	POH	314	N42°44'	W94°38'	—
Price (LOM)	AL	382	N42°37'	W92°30'	921
Puff	PUF	345	N43°21'	W94°44'	1300
Red Oak	RDK	230	N41°00'	W95°15'	1040
Rock Rapids	RRQ	515	N43°27'	W96°10'	1360
Sac City	SKI	356	N42°22'	W94°58'	1245
Salix (LOM/NDB)	SU	414	N42°19'	W96°17'	1080
Sheldon	SHL	338	N43°12'	W95°50'	1419
Shenandoah	SDA	411	N40°45'	W95°24'	968
Sibley	ISB	269	N43°22'	W95°45'	1531
Sioux Center	SOY	368	N43°07'	W96°11'	1435
Snore (LOM)	SP	394	N43°13'	W95°19'	1430
Storm Lake	SLB	227	N42°36'	W95°14'	1485
Surff (LOM)	MC	308	N43°03'	W93°19'	—
Tommi (LOM/NDB)	OI	305	N42°27'	W96°27'	—
Union Co	UNE	379	N40°57'	W94°20'	1268
Wapsie	IIB	206	N42°27'	W91°57'	960
Washington	AWG	219	N41°16'	W91°40'	752
Webster City	EBS	323	N42°26'	W93°52'	1100
West Union	XWY	278	N42°56'	W91°46'	1250
Zilom (LOM)	DB	341	N42°19'	W90°35'	980

Kansas

Airports

Great Bend, KS – Great Bend Muni

Ident	GBD	**ATIS**	122.80
Elev	1887	**Rwy/Length/ILS/ID**	11/4698
Lat	N38°20'		29/4698
Long	W98°51'		17/7999
			35/7999/111.90/IGBD

Topeka, KS – Philip Billard

Ident	TOP	**ATIS**	118.70
Elev	1080	**Rwy/Length/ILS/ID**	03/8002
Lat	N39°04'		21/8002
Long	W95°37'		13/12819/110.70/ITOP
			31/12819

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Anthony	VORTAC	ANY	112.90	N37°09'	W98°10'	1390
Chanute	VOR-DME	CNU	109.20	N37°37'	W95°35'	1080
Dodge City	VORTAC	DDC	108.20	N37°51'	W100°00'	2565
Emporia	VORTAC	EMP	112.80	N38°17'	W96°08'	1220
Fort Riley	VOR	FRI	109.40	N38°58'	W96°51'	1240
Garden City	VORTAC	GCK	113.30	N37°55'	W100°43'	2880
Goodland	VORTAC	GLD	115.10	N39°23'	W101°41'	3650
Hays	VORTAC	HYS	110.40	N38°50'	W99°16'	2020
Hill City	VORTAC	HLC	113.70	N39°15'	W100°13'	2690
Hutchinson	VORTAC	HUT	116.80	N37°59'	W97°56'	1530
Johnson Co	VOR-DME	OJC	113.00	N38°50'	W94°44'	1030
Liberal	VORTAC	LBL	112.30	N37°02'	W100°58'	2890
Manhattan	VOR-DME	MHK	110.20	N39°08'	W96°40'	1060
Mankato	VORTAC	TKO	109.80	N39°48'	W98°15'	1880
Oswego	VORTAC	OSW	117.60	N37°09'	W95°12'	930
Salina	VORTAC	SLN	117.10	N38°55'	W97°37'	1315
Strother	VOR	SOR	109.60	N37°10'	W97°02'	1160
Topeka	VORTAC	TOP	117.80	N39°08'	W95°32'	1070
Wichita	VORTAC	ICT	113.80	N37°44'	W97°35'	1470

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Atwood	ADT	365	N39°50'	W101°02'	2936
Babsy (LOM)	GB	419	N38°15'	W98°51'	1932
Bear Creek	JHN	341	N37°38'	W101°44'	3324
Biloy (LOM/NDB)	TO	521	N39°07'	W95°41'	913
Boyd	UKL	245	N38°17'	W95°43'	1171
Cavalry	CVY	314	N39°01'	W96°47'	1060
Clay Center	CYW	362	N39°22'	W97°09'	1205
Coffeyville	CFV	212	N37°05'	W95°34'	754
Concordia	CNK	335	N39°33'	W97°39'	1459
Dustt (LOM)	IX	368	N38°44'	W94°53'	1040
El Dorado	EQA	383	N37°46'	W96°48'	1370
Elkhart	EHA	377	N37°00'	W101°53'	3617
Flory (LOM)	SL	344	N38°40'	W97°38'	1315
Fort Scott	FSK	379	N37°47'	W94°45'	900
Furor (LOM)	OJ	526	N38°56'	W94°44'	1028
Harvs (LOM)	CA	395	N38°08'	W97°16'	1530
Herington	HRU	407	N38°41'	W96°48'	1485
Hilyn	HIL	308	N38°21'	W98°54'	1900
Hugoton	HQG	365	N37°09'	W101°22'	3129
Independence	IDP	400	N37°09'	W95°46'	826
Larned	LQR	296	N38°12'	W99°05'	2010
Lyons	LYO	386	N38°20'	W98°13'	—
Marysville	MYZ	341	N39°51'	W96°38'	997
Mc Dowell Creek	MQD	391	N39°07'	W96°37'	1060
Mc Pherson	MPR	227	N38°20'	W97°41'	1490
Meade	MEJ	389	N37°17'	W100°21'	—
Monarch	MSB	410	N37°47'	W95°24'	972
Morrison	DBX	212	N39°45'	W97°02'	1380
Nette (LOM)	HY	374	N38°46'	W99°15'	1978
Newton	EWK	281	N38°03'	W97°16'	—
Norton	NRN	230	N39°51'	W99°53'	2343
Oakley	OEL	380	N39°06'	W100°48'	3042
Oberlin	OIN	341	N39°49'	W100°32'	2655
Ottawa	OWI	251	N38°32'	W95°15'	959
Panck (LOM)	LB	383	N36°57'	W100°57'	2845
Parsons	PPF	293	N37°20'	W95°30'	887
Phillipsburg	PHG	368	N39°42'	W99°17'	1855
Piche (LOM/NDB)	IC	332	N37°34'	W97°27'	—
Pieve (LOM/NDB)	GC	347	N37°49'	W100°43'	2824
Pittsburg	PTS	365	N37°26'	W94°43'	918
Pratt	PTT	356	N37°43'	W98°44'	1951
Republican	RPB	414	N39°48'	W97°39'	—
Riply (LOM)	FO	326	N38°53'	W95°34'	1048
Saint Francis	SYF	386	N39°43'	W101°45'	3454
Saltt (LOM)	HU	404	N38°07'	W97°55'	—
Sawcy (LOM)	SO	353	N37°05'	W97°02'	1169
Scott City	TQK	256	N38°28'	W100°53'	2962
Shugr (LOM/NDB)	GL	414	N39°17'	W101°36'	3597
Ulysses	ULS	395	N37°35'	W101°22'	—
Wellington	EGT	414	N37°19'	W97°23'	1270
Wheatfield	JDM	408	N39°30'	W101°02'	3153

Kentucky

Airports

Louisville, KY – Standiford Field

Ident	SDF	**ATIS**	118.15
Elev	496	**Rwy/Length/ILS/ID**	01/10001/110.30/ISDF
Lat	N38°10'		19/10001/111.30/IADO
Long	W85°44'		11/7249
			29/7249/109.10/ILKS

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Bowling Green	VORTAC	BWG	117.90	N36°55'	W86°26'	560
Bowman	VOR-DME	BQM	112.20	N38°13'	W85°39'	540
Central City	VORTAC	CCT	109.80	N37°22'	W87°15'	480
Cunningham	VORTAC	CNG	113.10	N37°00'	W88°50'	480
Falmouth	VOR-DME	FLM	117.00	N38°38'	W84°18'	810
Fort Knox	VOR-DME	FTK	109.60	N37°54'	W85°58'	740
Frankfort	VOR	FFT	109.40	N38°10'	W84°54'	805
Hazard	VOR-DME	AZQ	111.20	N37°23'	W83°15'	1247
Lexington	VORTAC	HYK	112.60	N37°57'	W84°28'	1040
London	VORTAC	LOZ	116.10	N37°01'	W84°06'	1250
Louisville	VORTAC	IIU	114.80	N38°06'	W85°34'	720
Mystic	VOR	MYS	108.20	N37°53'	W86°14'	790
New Hope	VOR-DME	EWO	110.80	N37°37'	W85°40'	960
Newcombe	VORTAC	ECB	110.40	N38°09'	W82°54'	1070
Owensboro	VOR-DME	OWB	108.60	N37°44'	W87°09'	400

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Airbe (LOM/NDB)	FK	293	N36°44'	W87°24'	593
Bardstown	BRY	248	N37°50'	W85°28'	—
Beaver Creek	BVQ	260	N37°01'	W86°00'	745
Blayd (LOM/NDB)	LE	242	N37°59'	W84°39'	—
Claww (LOM/NDB)	SD	229	N38°05'	W85°45'	—
Cumberland River	CDX	388	N36°59'	W84°40'	955
Elk Spring	EKQ	290	N36°51'	W84°51'	950
Farrington	FIQ	263	N36°58'	W88°34'	—
Flemingsburg	FGX	400	N38°32'	W83°44'	921
Frankfort	FKR	278	N40°16'	W86°33'	805
Geneva	GVA	224	N37°48'	W87°46'	450
Godman	GOI	396	N37°57'	W85°58'	—
Goodall	DVK	311	N37°34'	W84°45'	1000
Higuy (LOM)	OW	341	N37°38'	W87°09'	—
Honey Grove	HIX	356	N36°52'	W87°20'	610
Jett	JET	365	N38°12'	W84°49'	—
Laang (LOM)	LK	414	N38°08'	W85°37'	624
Mayfield	GGK	401	N36°41'	W88°35'	490
Mount Sterling	IOB	210	N38°03'	W83°58'	1016
Muhlenberg	GMH	362	N37°13'	W87°09'	420
Seco	XYC	393	N37°45'	W84°01'	780
Springfield	IKY	429	N37°38'	W85°14'	927
Taylor Co	TYC	272	N37°24'	W85°14'	1053
Tradewater	TWT	276	N37°27'	W87°56'	402

Louisiana

Airports

New Orleans, LA – New Orleans Intl

Ident	MSY	**ATIS**	127.55
Elev	6	**Rwy/Length/ILS/ID**	01/7000/111.70/IJFI
Lat	N29°59'		19/7000
Long	W90°15'		06/4542
			24/4542
			10/10080/109.90/IMSY
			28/10080/109.90/IHOX

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Alexandria	VORTAC	AEX	116.10	N31°15'	W92°30'	80
Barksdale	VOR	BAD	115.80	N32°30'	W93°40'	160
Baton Rouge	VORTAC	BTR	116.50	N30°29'	W91°17'	20
Downtown	VOR	DTN	108.60	N32°32'	W93°44'	180
Elm Grove	VORTAC	EMG	111.20	N32°24'	W93°35'	160
Esler	VORTAC	ESF	117.90	N31°26'	W92°19'	195
Hammond	VOR	HMU	109.60	N30°31'	W90°25'	40
Harvey	VORTAC	HRV	112.40	N29°51'	W90°00'	1
Lake Charles	VORTAC	LCH	113.40	N30°08'	W93°06'	20
Leeville	VORTAC	LEV	113.50	N29°10'	W90°06'	2
Monroe	VORTAC	MLU	117.20	N32°31'	W92°02'	80
New Orleans	VORTAC	MSY	113.20	N30°01'	W90°10'	1
Polk	VOR	FXU	108.40	N31°06'	W93°13'	310
Shreveport	VORTAC	SHV	117.40	N32°46'	W93°48'	—
Tibby	VORTAC	TBD	112.00	N29°39'	W90°49'	10
White Lake	VOR-DME	LLA	111.40	N29°39'	W92°22'	5

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Acadi (LOM/NDB)	AR	269	N29°57'	W91°51'	—
Andra (LOM)	ANDRA	223	N31°23'	W92°10'	—
Anger (LOM)	HP	212	N30°36'	W90°25'	94
Bastrop	BQP	329	N32°45'	W91°53'	—
Campi (LOM/NDB)	IE	407	N31°39'	W93°04'	—
Carma (LOM/NDB)	BX	353	N30°52'	W89°51'	14
Crakk (LOM/NDB)	SH	230	N32°30'	W93°52'	—
De Quincy	DQU	410	N30°26'	W93°28'	82
Florenville	FNA	371	N30°24'	W89°49'	—
Gator	GUV	359	N31°01'	W93°11'	—
Grand Isle	GNI	236	N29°11'	W90°04'	—
Hazer (LOM/NDB)	HZ	356	N30°37'	W91°29'	—
Hodge	JBL	256	N32°12'	W92°43'	240
Homer	HMQ	212	N32°47'	W93°00'	—
Houma (LOM)	HU	219	N29°39'	W90°39'	6
Idder (LOM/NDB)	DR	385	N30°45'	W93°20'	160
Keyli (LOM)	LC	353	N30°11'	W93°15'	—
Kinte (LOM/NDB)	MS	338	N30°01'	W90°23'	—
Laffs (LOM)	LF	375	N30°17'	W91°54'	—
Lake Providence	BLE	278	N32°49'	W91°11'	—
Leesville	VED	247	N31°06'	W93°20'	250
Mansfield	MSD	414	N32°03'	W93°45'	—
Many	MMY	272	N31°34'	W93°32'	324
Marksville	MKV	347	N31°05'	W92°04'	78
Minden	MNE	201	N32°38'	W93°18'	—
Molly Ridge	MRK	338	N32°24'	W91°46'	75
Mossy (LOM)	CW	418	N30°18'	W93°11'	23
Nados (LOM/NDB)	OC	253	N31°29'	W94°43'	360
Patterson	PTN	245	N29°42'	W91°20'	—
Rundi (LOM)	BT	284	N30°34'	W91°12'	—
Sabar (LOM)	ML	219	N32°27'	W92°06'	—
Saint Landry	OPL	335	N30°39'	W92°05'	57
Slidell	DEF	256	N30°17'	W89°50'	15
Springhill	SPH	375	N32°58'	W93°24'	—
Vivian	VIV	284	N32°51'	W94°00'	250
Winnfield	IFJ	402	N31°57'	W92°39'	153

Maine

Airports

Portland, ME – Portland Intl Jetport

Ident	PWM	**ATIS**	119.05
Elev	74	**Rwy/Length/ILS/ID**	11/6800/109.90/IPWM
Lat	N43°38'		29/6800/109.90/IGCS
Long	W70°18'		18/5001
			36/5001

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Augusta	VORTAC	AUG	111.40	N44°19'	W69°47'	350
Bangor	VORTAC	BGR	114.80	N44°50'	W68°52'	360
Brunswick	VOR	NHZ	115.20	N43°54'	W69°56'	75
Houlton	VOR-DME	HUL	116.10	N46°02'	W67°50'	860
Kennebunk	VORTAC	ENE	117.10	N43°25'	W70°36'	190
Millinocket	VORTAC	MLT	117.90	N45°35'	W68°30'	550
Presque Isle	VORTAC	PQI	116.40	N46°46'	W68°05'	590

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Belfast	BST	278	N44°24'	W69°00'	195
Bracy (LOM/NDB)	RL	399	N44°27'	W69°44'	335
Burnham	BUP	348	N44°41'	W69°21'	—
Dunns (LOM)	AU	366	N44°24'	W69°51'	239
Eastport	EPM	260	N44°54'	W67°00'	46
Excal (LOM)	PQ	278	N46°36'	W68°01'	—
Frenchville	FVE	257	N47°16'	W68°15'	—
Lewie (LOM)	LE	240	N43°57'	W70°20'	310
Lincoln	LRG	216	N45°21'	W68°32'	204
Machias	MVM	251	N44°42'	W67°28'	97
Milnot	LNT	344	N45°38'	W68°33'	—
Old Town	OLD	272	N45°00'	W68°38'	—
Orham (LOM)	PW	394	N43°39'	W70°26'	—
Rangeley	RQM	221	N44°56'	W70°45'	1560
Sanfd (LOM)	SF	349	N43°20'	W70°50'	—
Sebago	SZO	227	N43°54'	W70°46'	950
Sprucehead	SUH	356	N43°59'	W69°07'	—
Squaw	XQA	236	N45°31'	W69°40'	1185
Surry (LOM/NDB)	BH	330	N44°32'	W68°18'	55
Totte (LOM)	BG	227	N44°43'	W68°42'	—
Wiscasset	ISS	407	N43°58'	W69°38'	160

Maryland

Airports

Baltimore, MD – Baltimore/Wash Intl

Ident	BWI	**ATIS**	115.1
Elev	146	**Rwy/Length/ILS/ID**	04/6005
Lat	N39°10'		22/6005
Long	W76°40'		10/9452/109.70/IBAL
			28/9452/109.70/IOEH
			15R/9519/111.70/IFND
			33L/9519/111.70/IRUX
			15L/5000/111.95/IUQC
			33R/5000/111.95/IBWI

Camp Springs, MD – Andrews AFB

Ident	ADW	**ATIS**	113.1
Elev	281	**Rwy/Length/ILS/ID**	01L//110.5/IRWS
Lat	N38°48'		19R//111.5/IMXK
Long	W76°52'		

College, MD – College Park

Ident	CGS	**ATIS**	—
Elev	50	**Rwy/Length**	—
Lat	N38°58'		
Long	W76°55'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Andrews	VORTAC	ADW	113.10	N38°48'	W76°51'	260
Baltimore	VORTAC	BAL	115.10	N39°10'	W76°39'	140
Frederick	VOR	FDK	109.00	N39°24'	W77°22'	300
Grantsville	VOR-DME	GRV	112.30	N39°38'	W79°03'	2640
Hagerstown	VOR	HGR	109.80	N39°41'	W77°51'	560
Nottingham	VORTAC	OTT	113.70	N38°42'	W76°44'	210
Patuxent	VORTAC	PXT	117.60	N38°17'	W76°24'	18
Phillips	VOR	PPM	108.40	N39°28'	W76°10'	41
Salisbury	VORTAC	SBY	111.20	N38°20'	W75°30'	50
Snow Hill	VORTAC	SWL	112.40	N38°03'	W75°27'	40
Test Test	VOR-DME	ESN	112.80	N38°48'	W76°04'	58
Westminster	VORTAC	EMI	117.90	N39°29'	W76°58'	820

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Aberdeen	APG	349	N39°32'	W76°06'	45
Cambridge	CGE	257	N38°32'	W76°01'	—
Colbe (LOM)	SB	278	N38°16'	W75°24'	—
Cresap	RYP	339	N39°30'	W78°46'	589
Cumberland	CBE	317	N39°38'	W78°44'	—
Easton	ESN	212	N38°48'	W76°04'	58
Ellicott	FND	371	N39°17'	W76°46'	—
Fort Meade	FME	353	N39°05'	W76°45'	—
Gaithersburg	GAI	385	N39°10'	W77°09'	540
Kirby (LOM)	RW	360	N38°42'	W76°52'	—
Landy (LOM/NDB)	OX	407	N38°21'	W75°11'	33
Martin	MTN	342	N39°17'	W76°22'	20
Patuxent River	NHK	400	N38°17'	W76°24'	18
Potomac	VKX	241	N38°44'	W76°57'	115
Zoote (LOM)	MX	232	N38°55'	W76°52'	74

Massachusetts

Airports

Boston, MA – General E.L. Logan Intl

Ident	BOS	**ATIS**	135.00
Elev	20	**Rwy/Length/ILS/ID**	4R/10005/110.3/IBOS
Lat	N42°21'		22L/10005/110.3/ILQN
Long	W71°00'		4L/7860
			22R/7860
			9/7000
			27/7000/111.3/IDGU
			15R/10081/110.7/IMDC
			33L/10081/110.7/ILIP
			15L/2557
			33R/2557

Edgartown, MA – Katama Airpark

Ident	1B2	**ATIS**	—
Elev	20	**Rwy/Length**	—
Lat	N42°21'		
Long	W70°31'		

Martha's Vineyard, MA – Martha's Vineyard

Ident	MVY	**ATIS**	126.25
Elev	68	**Rwy/Length/ILS/ID**	06/5500
Lat	N41°23'		24/5500/108.70/IMVY
Long	W70°36'		15/3297
			33/3297

Southbridge, MA – Southbridge Muni

Ident	3B0	**ATIS**	—
Elev	697	**Rwy/Length**	02/3500
Lat	N42°06'		20/3500
Long	W72°02'		10/1450 Grass
			28/1450 Grass

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Barnes	VORTAC	BAF	113.00	N42°09'	W72°42'	—
Boston	VORTAC	BOS	112.70	N42°21'	W70°59'	20
Chester	VOR-DME	CTR	115.10	N42°17'	W72°56'	1600
Gardner	VORTAC	GDM	110.60	N42°32'	W72°03'	1280
Lawrence	VOR-DME	LWM	112.50	N42°44'	W71°05'	300
Marconi	VORTAC	LFV	114.70	N42°01'	W70°02'	152
Marthas Vineyard	VOR-DME	MVY	114.50	N41°23'	W70°36'	60
Nantucket	VORTAC	ACK	116.20	N41°16'	W70°01'	100
Westover	VOR	CEF	114.00	N42°11'	W72°31'	820

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Bedds (LOM)	BE	332	N42°28'	W71°23'	—
Bogey (LOM)	HYX	342	N41°42'	W70°12'	—
Crow Hill	CLY	392	N42°15'	W71°46'	—
Dalton	DXT	370	N42°28'	W73°10'	1082
Dickinson	DKO	352	N42°38'	W71°43'	501
Dunca (LOM)	RS	279	N42°16'	W72°01'	—
Fall River	FLR	406	N41°45'	W71°06'	—
Fitchburg	FIT	365	N42°33'	W71°45'	—
Great Barringto	GBR	395	N42°10'	W73°24'	—
Haget (LOM)	LW	402	N42°38'	W71°11'	130
Hullz (LOM)	LI	346	N42°18'	W70°55'	—
Lyndy (LOM/NDB)	LQ	382	N42°27'	W70°57'	8
Mansfield	IHM	220	N42°00'	W71°11'	120
Marshfield	IMR	368	N42°05'	W70°40'	64
Millt (LOM)	BO	375	N42°16'	W71°02'	6
Nantucket	TUK	194	N41°16'	W70°10'	—
Nauset	CQX	279	N41°41'	W69°59'	40
Nefor (LOM)	EW	274	N41°37'	W71°01'	—
Orange	ORE	205	N42°33'	W72°12'	—
Otis (LOM)	FMH	362	N41°43'	W70°26'	80
Palmer	PMX	212	N42°13'	W72°18'	—
Plymouth	FFF	257	N41°50'	W70°48'	140
Provincetown	PVC	389	N42°04'	W70°13'	43
Shaker Hill	SKR	251	N42°27'	W71°10'	345
Stoge (LOM)	OW	397	N42°07'	W71°07'	178
Taunton	TAN	227	N41°52'	W71°01'	—
Topsfield	TOF	269	N42°37'	W70°57'	—
Waivs (LOM)	AC	248	N41°18'	W69°59'	—
Wesie (LOM)	BA	230	N42°14'	W72°41'	—

Michigan

Airports

Grand Rapids, MI – Kent County Intl

Ident	GRR	**ATIS**	127.10
Elev	794	**Rwy/Length/ILS/ID**	8R/10000/108.30/ICYZ
Lat	W42 53		26L/10000/109.70/IGRR
Long	W85°31'		8L/3918
			26R/3918
			18/3400
			36/3400

Marquette, MI – Marquette County

Ident	MQT	**ATIS**	123.00
Elev	1419	**Rwy/Length/ILS/ID**	01/3000
Lat	N46°32'		19/3000
Long	W87°33'		08/6500/110.50/IMQT
			26/6500

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Alpena	VORTAC	APN	108.80	N45°04'	W83°33'	680
Au Sable	VORTAC	ASP	116.10	N44°26'	W83°24'	620
Bad Axe	VOR-DME	BAX	108.20	N43°46'	W82°59'	755
Battle Creek	VORTAC	BTL	109.40	N42°18'	W85°15'	930
Carleton	VORTAC	CRL	115.70	N42°02'	W83°27'	630
Detroit	VOR-DME	DXO	113.40	N42°12'	W83°22'	640
Escanaba	VORTAC	ESC	110.80	N45°43'	W87°05'	600
Flint	VORTAC	FNT	116.90	N42°57'	W83°44'	770
Gaylord	VOR-DME	GLR	109.20	N45°00'	W84°42'	1320
Giper	VORTAC	GIJ	115.40	N41°46'	W86°19'	800
Grand Rapids	VOR-DME	GRR	110.20	N42°47'	W85°29'	800
Grayling	VOR	CGG	109.80	N44°40'	W84°43'	1153
Houghton	VORTAC	CMX	112.80	N47°10'	W88°28'	1072
Houghton Lake	VOR-DME	HTL	111.60	N44°21'	W84°39'	1145
Iron Mountain	VORTAC	IMT	111.20	N45°48'	W88°06'	1130

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Ironwood	VORTAC	IWD	108.80	N46°31'	W90°07'	1230
Jackson	VOR-DME	JXN	109.60	N42°15'	W84°27'	1000
K I Sawyer	VORTAC	SAW	116.30	N46°21'	W87°23'	1170
Kalamazoo	VOR-DME	AZO	109.00	N42°14'	W85°33'	870
Keeler	VORTAC	ELX	116.60	N42°08'	W86°07'	800
Lansing	VORTAC	LAN	110.80	N42°43'	W84°41'	880
Litchfield	VORTAC	LFD	111.20	N42°03'	W84°45'	1040
Manistee	VOR-DME	MBL	111.40	N44°16'	W86°13'	620
Marquette	VOR-DME	MQT	116.80	N46°31'	W87°35'	1450
Menominee	VOR-DME	MNM	109.60	N45°10'	W87°38'	650
Mount Pleasant	VOR-DME	MOP	110.60	N43°37'	W84°44'	760
Muskegon	VORTAC	MKG	115.20	N43°10'	W86°02'	660
Newberry	VOR-DME	ERY	108.20	N46°18'	W85°27'	870
Peck	VORTAC	ECK	114.00	N43°15'	W82°43'	810
Pellston	VORTAC	PLN	111.80	N45°37'	W84°39'	840
Pontiac	VORTAC	PSI	111.00	N42°42'	W83°31'	1150
Pullman	VORTAC	PMM	112.10	N42°27'	W86°06'	640
Saginaw	VORTAC	MBS	112.90	N43°31'	W84°04'	670
Salem	VORTAC	SVM	114.30	N42°24'	W83°35'	950
Sault Ste Marie	VORTAC	SSM	112.20	N46°24'	W84°18'	690
Schoolcraft Co	VOR-DME	ISQ	110.4	N45°58'	W86°10'	684
Traverse City	VORTAC	TVC	114.60	N44°40'	W85°32'	910
West Branch	VOR-DME	BXZ	113.20	N44°14'	W84°11'	805
White Cloud	VORTAC	HIC	117.60	N43°34'	W85°42'	920

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Adrian	ADG	278	N41°52'	W84°04'	—
Alma	AMN	329	N43°19'	W84°47'	—
Alpine	ALV	375	N45°00'	W84°48'	—
Artda (LOM)	LA	206	N42°46'	W84°29'	841
Austn (LOM)	AZ	371	N42°07'	W85°31'	—
Batol (LOM/NDB)	BTI	272	N42°21'	W85°11'	—
Berz	UIZ	215	N42°39'	W82°57'	—
Boyne Falls	BFA	263	N45°10'	W84°55'	707
Browne	HYX	385	N43°25'	W83°51'	600
Cadillac	CAD	269	N44°16'	W85°24'	1295
Cargl (LOM/NDB)	VQ	230	N42°21'	W82°57'	580
Charlevoix	CVX	222	N45°18'	W85°15'	655
Clam Lake	CXK	251	N44°53'	W85°14'	799
Deckerville	DQV	378	N43°34'	W82°39'	750
Drummond Island	DRM	218	N46°00'	W83°44'	580
Felps (LOM)	APH	206	N44°57'	W83°33'	750
Galey (LOM/NDB)	CM	275	N47°06'	W88°24'	—
Grayling	GYG	359	N44°44'	W84°49'	1178
Grosse Ile	RYS	419	N42°06'	W83°09'	577
Gwenn (LOM/NDB)	TV	365	N44°44'	W85°25'	—
Hardwood	BHW	236	N44°14'	W84°05'	800
Holland	HLM	233	N42°47'	W86°09'	—
Howell	OZW	242	N42°38'	W83°59'	951
Jakso (LOM)	JX	212	N42°19'	W84°21'	—
Knobs (LOM)	GR	263	N42°53'	W85°22'	—
Koloe (LOM/NDB)	CI	400	N46°19'	W84°32'	696
Litchfield	LTD	371	N39°09'	W89°40'	1040
Ludington	LDM	341	N43°57'	W86°24'	642
Madds (LOM)	DE	338	N42°29'	W83°05'	—
Mally (LOM)	BE	397	N42°07'	W86°18'	—
Musko (LOM)	MK	219	N43°07'	W86°10'	—
Olste (LOM)	MB	257	N43°27'	W84°10'	200
Ontonagon	OGM	375	N46°51'	W89°21'	882
Petli (LOM)	FN	269	N42°58'	W83°53'	—
Phurn (LOM)	PH	332	N42°50'	W82°35'	635
Revup (LOM)	DT	388	N42°07'	W83°25'	631
Rogers City	PZQ	215	N45°24'	W83°49'	665
Spenc (LOM)	DM	223	N42°13'	W83°12'	—
Sturgis	IRS	382	N41°48'	W85°26'	—
Three Rivers	HAI	407	N41°57'	W85°35'	—
Tribe (LOM)	TN	239	N45°03'	W87°41'	613
Watersmeet	RXW	407	N46°17'	W89°16'	1625
Wiggins	GDW	209	N43°58'	W84°28'	—
Yipps (LOM)	YI	359	N42°10'	W83°37'	—

Minnesota

Airports

Duluth, MN – Duluth Intl

Ident	DLH	**ATIS**	124.10
Elev	1428	**Rwy/Length/ILS/ID**	03/5699
Lat	N46°50'		21/5699
Long	W92°11'		09/10152/110.30/IDLH
			27/10152/108.70/IJUD

Minneapolis, MN – Minneapolis-St. Paul

Ident	MSP	**ATIS**	135.35
Elev	841	**Rwy/Length/ILS/ID**	04/8256/109.30/IAPL
Lat	N44°53'		22/8256/110.50/ISIJ
Long	W93°13'		11R/10000/110.30/IHKZ
			29L/10000/110.30/IMSP
			11L/8200/110.70/IPJL
			29R/8200/109.90/IINN

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Albert Lea	VOR-DME	AEL	109.80	N43°40'	W93°22'	1253
Alexandria	VORTAC	AXN	112.80	N45°57'	W95°13'	1380
Austin	VOR-DME	JAY	108.20	N43°34'	W92°55'	1232
Baudette	VOR-DME	BDE	111.60	N48°43'	W94°36'	1080
Bemidji	VORTAC	BJI	108.60	N47°34'	W95°01'	1410
Brainerd	VORTAC	BRD	116.90	N46°20'	W94°01'	1250
Camp Ripley	VOR	RYM	111.10	N46°05'	W94°21'	1154
Darwin	VORTAC	DWN	109.00	N45°05'	W94°27'	1130
Detroit Lakes	VOR-DME	DTL	111.20	N46°49'	W95°52'	1390
Duluth	VORTAC	DLH	112.60	N46°48'	W92°12'	1430
Ely	VOR-DME	ELO	109.60	N47°49'	W91°49'	1490
Eveleth	VOR-DME	EVM	108.20	N47°25'	W92°30'	1380
Fairmont	VOR-DME	FRM	110.20	N43°38'	W94°25'	1160
Farmington	VORTAC	FGT	115.70	N44°37'	W93°10'	930
Fergus Falls	VOR-DME	FFM	110.40	N46°17'	W96°09'	1190
Flying Cloud	VOR-DME	FCM	111.80	N44°49'	W93°27'	900
Gopher	VORTAC	GEP	117.30	N45°08'	W93°22'	880
Grand Rapids	VOR-DME	GPZ	111.40	N47°09'	W93°29'	1400
Halfway	VOR-DME	FOW	111.20	N44°12'	W93°22'	1099
Hibbing	VOR-DME	HIB	110.80	N47°18'	W92°42'	1350
Humboldt	VORTAC	HML	112.40	N48°52'	W97°07'	800
Intl Falls	VORTAC	INL	111.00	N48°33'	W93°24'	1180
Mankato	VOR-DME	MKT	110.80	N44°13'	W93°54'	1020
Marshall	VOR-DME	MML	111.00	N44°26'	W95°49'	1180
Minneapolis	VORTAC	MSP	115.30	N44°52'	W93°13'	850
Montevideo	VOR-DME	MVE	111.60	N44°58'	W95°42'	1030
Morris	VOR-DME	MOX	109.60	N45°33'	W95°58'	1130
Nodine	VORTAC	ODI	117.90	N43°54'	W91°28'	1280
Park Rapids	VOR-DME	PKD	110.60	N46°53'	W95°04'	1440
Princeton	VOR-DME	PNN	114.30	N45°19'	W67°42'	979
Redwood Falls	VORTAC	RWF	113.30	N44°28'	W95°07'	1060
Rochester	VOR-DME	RST	112.00	N43°46'	W92°35'	1380
Roseau	VOR-DME	ROX	108.80	N48°51'	W95°41'	1060
Saint Cloud	VOR-DME	STC	112.10	N45°32'	W94°03'	1020
Thief River Falls	VOR-DME	TVF	108.4	N48°04'	W96°11'	1110
Willmar	VOR-DME	ILL	113.70	N45°07'	W95°05'	1120
Winona	VOR-DME	ONA	111.40	N44°04'	W91°42'	650
Worthington	VOR-DME	OTG	110.60	N43°38'	W95°34'	1570

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Aitkin	AIT	397	N46°32'	W93°40'	1207
Andri	AJW	281	N45°47'	W95°18'	1404
Appleton	AQP	356	N45°13'	W96°00'	1018
Babco (LOM)	BA	385	N44°51'	W92°59'	957
Benson	BBB	239	N45°19'	W95°39'	1080
Blue Earth	SBU	332	N43°35'	W94°05'	1083
Bunan (LOM)	MD	371	N47°26'	W94°50'	1350
Caledonia	CHU	209	N43°35'	W91°29'	1130
Cambridge	CBG	350	N45°33'	W93°15'	935
Cloquet	COQ	335	N46°41'	W92°30'	—
Cook	CQM	233	N47°49'	W92°41'	1322
Cook Co	CKC	358	N47°50'	W90°23'	1762
Crookston	CKN	400	N47°50'	W96°36'	895
Dawson-Madison	DXX	227	N44°59'	W96°10'	1077
Fosston	FSE	224	N47°35'	W95°46'	1276
Galex (LOM)	GP	272	N47°07'	W93°28'	1310
Glenwood	GHW	346	N45°38'	W95°19'	1385
Hamre (LOM)	FF	337	N46°13'	W96°03'	1160
Harvi (LOM)	HY	260	N48°00'	W96°05'	1114
Hopey	PPI	400	N44°52'	W92°56'	—
Humbolt	HXM	366	N40°59'	W75°59'	800
Hussk (LOM)	ST	342	N45°28'	W93°58'	980
Hutchinson	HCD	209	N44°51'	W94°22'	1060
Jackson	MJQ	353	N43°38'	W94°59'	1480
Larew (LOM)	BR	251	N46°27'	W94°01'	1259
Little Falls	LXL	359	N45°56'	W94°20'	1120
Mingo (LOM)	RS	329	N43°51'	W92°24'	1263
Mora	JMR	327	N45°53'	W93°16'	997
Narco (LOM/NDB)	MS	266	N44°49'	W93°05'	880
New Ulm	ULM	272	N44°19'	W94°29'	1010
Orr	ORB	341	N48°01'	W92°51'	1309
Ortonville	VVV	332	N45°18'	W96°25'	1050
Piney Pinecreek	PFT	342	N48°59'	W95°58'	1060
Pipestone	PQN	284	N43°59'	W96°17'	1778
Princeton	PNM	368	N45°33'	W93°36'	979
Pykla (LOM/NDB)	DL	379	N46°50'	W92°21'	—
Raize (LOM/NDB)	IN	353	N48°28'	W93°16'	—
Red Wing	RGK	248	N44°35'	W92°29'	782
Ripley	XCR	404	N46°04'	W94°20'	—
Roadd (LOM)	SW	360	N48°51'	W95°14'	—
Scott	SCG	385	N48°15'	W92°28'	—
Silver Bay	BFW	350	N47°15'	W91°24'	—
Spida (LOM/NDB)	PK	269	N46°50'	W94°58'	1412
Staples	SAZ	257	N46°22'	W94°48'	1285
Two Harbors	TWM	243	N47°03'	W91°44'	1071
Vagey (LOM)	AP	338	N44°49'	W93°18'	—
Waseca	ACQ	371	N44°04'	W93°33'	1120
Wheaton	ETH	326	N45°46'	W96°32'	1225
Windom	MWM	203	N43°54'	W95°06'	—

Mississippi

Airports

Jackson, MS – Allen C. Thompson Fld

Ident	JAN	**ATIS**	—
Elev	349	**Rwy/Length/ILS/ID**	15R/8501
Lat	N32°19'		33L/8501/110.30/IFRL
Long	W90°04'		15L/8500/110.50/IJAN
			33R/8500

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Bigbee	VORTAC	IGB	116.20	N33°29'	W88°30'	240
Caledonia	VORTAC	CBM	115.20	N33°38'	W88°26'	220
Eaton	VORTAC	LBY	110.60	N31°25'	W89°20'	290
Greene Co	VORTAC	GCV	115.70	N31°05'	W88°29'	300
Greenville	VOR-DME	GLH	110.20	N33°31'	W90°58'	130
Gulfport	VORTAC	GPT	109.00	N30°24'	W89°04'	20
Holly Springs	VORTAC	HLI	112.40	N34°46'	W89°29'	630
Jackson	VORTAC	JAN	112.60	N32°30'	W90°10'	360
Kewanee	VORTAC	EWA	113.80	N32°22'	W88°27'	300
Mc Comb	VORTAC	MCB	116.70	N31°18'	W90°15'	440
Meridian	VORTAC	MEI	117.00	N32°22'	W88°48'	580
Natchez	VOR-DME	HEZ	110.00	N31°37'	W91°17'	280
Picayune	VORTAC	PCU	112.20	N30°33'	W89°43'	70
Sidon	VORTAC	SQS	114.70	N33°27'	W90°16'	125
Tupelo	VOR-DME	TUP	109.80	N34°13'	W88°47'	360

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Allen (LOM)	JA	365	N32°24'	W90°07'	—
Bayou (LOM)	GP	360	N30°29'	W89°09'	—
Brenz (LOM/NDB)	JH	260	N32°24'	W90°15'	314
Brookhaven	BVV	407	N31°36'	W90°24'	485
Bryan	STF	281	N33°25'	W88°51'	333
Clarksdale	CKM	341	N34°17'	W90°30'	—
Corinth	CRX	338	N34°54'	W88°36'	—
Ferni (LOM/NDB)	MC	413	N31°15'	W90°30'	480
Foxworth	FOH	331	N31°17'	W89°49'	—
Hanco	AYI	221	N30°27'	W89°27'	90
Indianola	IDL	284	N33°28'	W90°40'	126
Kosciusko	OSX	269	N33°05'	W89°32'	—
Louisville	LMS	212	N33°08'	W89°03'	—
Marks	MMS	391	N34°13'	W90°17'	—
Meridian	MPA	238	N43°35'	W116°34'	580
Metcalf	MTQ	359	N33°25'	W90°58'	120
Natchez-Adams Co	HAH	388	N31°41'	W91°17'	142
Olive Branch	OLV	275	N34°58'	W89°47'	401
Philadelphia	MPE	219	N32°47'	W89°07'	440
Prentiss	PJR	252	N31°35'	W89°54'	460
Raymond	RYB	375	N32°18'	W90°24'	257
Renova	RNV	272	N33°48'	W90°45'	—
Savoy (LOM/NDB)	ME	356	N32°14'	W88°46'	318
Scobey	SBQ	245	N33°53'	W89°52'	410
Tallahala	THJ	346	N31°41'	W89°11'	250
Teock (LOM)	GW	349	N33°35'	W90°05'	138
Tunng (LOM)	UV	426	N34°23'	W89°37'	410
Veron (LOM)	TU	420	N34°10'	W88°46'	325
Vicksburg	VKS	382	N32°13'	W90°55'	95

Missouri

Airports

Kansas City, MO – Kansas City Intl

Ident	MCI	**ATIS**	128.35
Elev	1026	**Rwy/Length/ILS/ID**	1L/10801/110.50/IDOT
Lat	N39°18'		19R/10801/109.10/IPAJ
Long	W94°43'		1R/5950
			19L/5950/109.55/IDYH
			09/9500/109.70/IRNI
			27/9500

St. Louis, MO – Lambert Intl

Ident	STL	**ATIS**	120.45
Elev	605	**Rwy/Length/ILS/ID**	06/7602
Lat	N38°44'		24/7602/110.30/ISTL
Long	W90°21'		12R/11019/109.70/ILMR
			30L/11019/111.50/IBKY
			30L/11019/110.55/IFXD
			12L/9003/108.90/ILDZ
			12L/9003/110.1/IABW
			30R/9003/111.30/ISJW
			13/6289
			31/6289
			17/3008
			35/3008

St. Louis, MO – Spirit of St. Louis

Ident	SUS	**ATIS**	134.8
Elev	463	**Rwy/Length/ILS/ID**	08R/111.9/ISUS
Lat	N38°39'		26L/111.9/IFZU
Long	W90°39'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Butler	VORTAC	BUM	115.90	N38°16'	W94°29'	890
Cape Girardeau	VOR-DME	CGI	112.90	N37°13'	W89°34'	340
Columbia	VOR-DME	COU	110.20	N38°48'	W92°13'	883
Dogwood	VORTAC	DGD	109.40	N37°01'	W92°52'	1600
Farmington	VORTAC	FAM	115.70	N37°40'	W90°14'	1220
Foristell	VORTAC	FTZ	110.80	N38°41'	W90°58'	817
Forney	VOR	TBN	110.00	N37°44'	W92°08'	1160
Hallsville	VORTAC	HLV	114.20	N39°06'	W92°07'	920
Higginsville	VOR	HIG	110.60	N39°04'	W93°40'	—
Kansas City	VORTAC	MKC	112.60	N39°16'	W94°35'	1060
Macon	VORTAC	MCM	112.90	N39°39'	W92°28'	870
Malden	VORTAC	MAW	111.20	N36°33'	W89°54'	280
Maples	VORTAC	MAP	113.40	N37°35'	W91°47'	1370
Napoleon	VORTAC	ANX	114.00	N39°05'	W94°07'	878
Neosho	VORTAC	EOS	116.60	N36°50'	W94°26'	1195
Riverside	VOR-DME	RIS	111.40	N39°07'	W94°35'	740
Saint Joseph	VORTAC	STJ	115.50	N39°57'	W94°55'	1159
Saint Louis	VORTAC	STL	117.40	N38°51'	W90°28'	450
Springfield	VORTAC	SGF	116.90	N37°21'	W93°20'	1240
Sunshine	VOR-DME	SHY	108.40	N38°02'	W92°36'	910
Vichy	VORTAC	VIH	117.70	N38°09'	W91°42'	1110

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Amazon	AZN	233	N39°53'	W94°54'	—
Bilmart	AOV	341	N36°58'	W92°40'	1302
Brookfield	BZK	383	N39°45'	W93°06'	845
Buckhorn	BHN	391	N37°41'	W92°06'	1098
Cameron	EZZ	394	N39°43'	W94°16'	1042
Charleston	CHQ	208	N36°50'	W89°21'	—
Chillicothe	CHT	375	N39°46'	W93°29'	—
Coole (LOM)	SG	404	N37°10'	W93°25'	—
Cuba	UBX	380	N38°03'	W91°25'	990
Dexter	DXE	423	N36°47'	W89°56'	308
Dotte (LOM/NDB)	DO	359	N39°13'	W94°44'	—
Dutch (LOM)	CG	248	N37°15'	W89°42'	—
Earli	FD	278	N36°40'	W90°19'	315
Eaves (LOM/NDB)	FZ	227	N38°40'	W90°32'	458
Emville	EVU	317	N40°20'	W94°54'	1130
Festus	FES	269	N38°11'	W90°23'	475
Golden Valley	GLY	388	N38°21'	W93°41'	818
Guthrie	FTT	317	N38°50'	W92°00'	877
Hannibal	HAE	411	N39°43'	W91°26'	760
Huggy (LOM)	RN	242	N39°18'	W94°51'	—
Kaiser	AIZ	272	N38°05'	W92°33'	863
Kennett	TKX	358	N36°13'	W90°02'	258
Kenzy (LOM)	MK	344	N39°13'	W94°33'	—
Lebanon	IEB	414	N37°34'	W92°39'	1325
Lunns (LOM)	JL	344	N37°12'	W94°33'	910
Marshall	PUR	371	N39°02'	W93°11'	779
Memorial	MEO	397	N38°33'	W92°04'	—
Moberly	MBY	302	N39°27'	W92°25'	866
Mountain View	MNF	365	N36°59'	W91°42'	1165
Nevada	EAD	209	N37°51'	W94°18'	878
New Madrid	EIW	314	N36°32'	W89°36'	285
Noah	ONH	515	N38°38'	W92°14'	545
Norge (LOM)	GQ	517	N39°03'	W94°39'	955
Oblio (LOM/NDB)	LM	338	N38°48'	W90°28'	446
Perrine	PRI	367	N37°45'	W90°25'	916
Point Lookout	PLK	326	N36°37'	W93°13'	933
Pomona	UNO	335	N36°52'	W91°54'	1260
Sedalia	DMO	281	N38°42'	W93°10'	880
Sikeston	SIK	272	N36°53'	W89°33'	350
Snoop (LOM)	SU	326	N38°38'	W90°46'	461
Spring River	LLU	356	N37°29'	W94°18'	1009
Sullivan	UUV	356	N38°14'	W91°09'	906
Tario (LOM)	ST	260	N39°40'	W94°54'	—
Trenton	TRX	400	N40°04'	W93°35'	758
Viertel	VER	347	N38°56'	W92°41'	—
Willard	ILJ	254	N37°17'	W93°26'	—
Zodia (LOM)	CO	407	N38°42'	W92°16'	850
Zumay (LOM)	ST	404	N38°47'	W90°16'	—

Montana

Airports

Billings, MT – Logan Intl

Ident	BIL	**ATIS**	126.30
Elev	3649	**Rwy/Length/ILS/ID**	07/5500
Lat	N45°48'		25/5500
Long	W108°32'		10R/3800
			28L/3800
			10L/10528/110.30/IBIL
			26R/10528
			16/4945
			34/4945

Great Falls, MT – Great Falls Intl

Ident	GTF	**ATIS**	126.60
Elev	3674	**Rwy/Length/ILS/ID**	03/10502/111.30/ISMR
Lat	N47°28'		21/10502
Long	W111°22'		07/4294
			25/4294
			16/6357
			34/6357

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Billings	VORTAC	BIL	114.50	N45°48'	W108°37'	3800
Bozeman	VOR-DME	BZN	112.20	N45°47'	W111°09'	4430
Coppertown	VORTAC	CPN	111.60	N46°01'	W112°44'	5780
Cut Bank	VORTAC	CTB	114.40	N48°33'	W112°20'	3780
Dillon	VORTAC	DLN	113.00	N45°14'	W112°32'	5260
Drummond	VOR	DRU	117.10	N46°38'	W113°11'	4150
Glasgow	VOR-DME	GGW	113.90	N48°12'	W106°37'	2280
Great Falls	VORTAC	GTF	115.10	N47°26'	W111°24'	3670
Havre	VOR-DME	HVR	111.80	N48°32'	W109°46'	2580
Helena	VORTAC	HLN	117.70	N46°36'	W111°57'	3820
Kalispell	VOR-DME	FCA	108.40	N48°12'	W114°10'	2980
Lewistown	VORTAC	LWT	112.00	N47°03'	W109°36'	4130
Livingston	VORTAC	LVM	116.10	N45°42'	W110°26'	4650
Miles City	VORTAC	MLS	112.10	N46°22'	W105°57'	2640
Missoula	VORTAC	MSO	112.80	N46°54'	W114°05'	3200
Whitehall	VORTAC	HIA	113.70	N45°51'	W112°10'	5530

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Broadus	BDX	335	N45°26'	W105°24'	2992
Capitol	CVP	317	N46°36'	W111°56'	—
Choteau	CII	269	N47°49'	W112°10'	3938
Conrad	CRD	293	N48°11'	W111°54'	—
Forsyth	FOR	236	N46°16'	W106°31'	2715
Glendive	GDV	410	N47°08'	W104°48'	2518
Harlowton	HWQ	242	N46°26'	W109°49'	—
Hauser	HAU	386	N46°34'	W111°45'	—
Horton	HTN	320	N46°24'	W105°56'	—
Jordan	JDN	263	N47°20'	W106°56'	—
Kona	INE	521	N47°05'	W114°23'	3720
Leeds	LDS	389	N48°32'	W109°41'	—
Lewistown	LWT	353	N47°04'	W109°32'	4100
Malta	MLK	272	N48°21'	W107°53'	—
Manni (LOM)	BZ	266	N45°52'	W111°17'	—
Milk River	MKR	339	N48°12'	W106°37'	—
Plentywood	PWD	251	N48°47'	W104°31'	—
Polson	PLS	275	N47°41'	W114°11'	2936
Red Lodge	RED	203	N45°14'	W109°15'	5467
Roundup	RPX	362	N46°28'	W108°34'	—
Saige (LOM)	BI	251	N45°51'	W108°41'	—
Scobey	SCO	283	N48°48'	W105°26'	2416
Shelby	SBX	347	N48°32'	W111°51'	3434
Sidney	SDY	359	N47°42'	W104°10'	—
Smith Lake	SAK	515	N48°06'	W114°27'	—
Targy (LOM/NDB)	LO	415	N44°34'	W111°11'	7000
Timber	BKU	344	N46°20'	W104°15'	—
Truly	ITU	371	N47°21'	W111°22'	4201
Wolf Point	OLF	404	N48°06'	W105°36'	—
Wondd (LOM)	OT	277	N43°36'	W95°27'	1515
Yellowstone	ESY	338	N44°41'	W111°07'	6697

Nebraska

Airports

Lincoln, NE – Lincoln Muni

Ident	LNK	**ATIS**	118.08
Elev	1214	**Rwy/Length/ILS/ID**	14/8620
Lat	N40°51'		32/8620
Long	W96°45'		17R/12901/111.10/IOCZ
			35L/12901/109.90/ILNK
			17L35R/5500

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Ainsworth	VOR-DME	ANW	112.70	N42°34'	W99°59'	2582
Alliance	VOR-DME	AIA	111.80	N42°03'	W102°48'	3925
Beatrice	VOR	BIE	110.60	N40°18'	W96°45'	1300
Chadron	VOR-DME	CDR	113.40	N42°33'	W103°18'	4630
Columbus	VOR-DME	OLU	111.80	N41°27'	W97°20'	1442
Cozad	VOR	OZB	109.00	N40°52'	W100°00'	2518
Custer Co	VOR	CUZ	108.20	N41°29'	W99°41'	2850
Grand Island	VORTAC	GRI	112.00	N40°59'	W98°18'	1840
Hastings	VOR-DME	HSI	108.80	N40°36'	W98°25'	1950
Hayes Center	VORTAC	HCT	117.70	N40°27'	W100°55'	3010
Kearney	VOR	EAR	111.20	N40°43'	W99°00'	2130
Lincoln	VORTAC	LNK	116.10	N40°55'	W96°44'	1370
Mc Cook	VOR-DME	MCK	116.50	N40°12'	W100°35'	2570

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Norfolk	VOR-DME	OFK	109.60	N41°59'	W97°26'	20
North Platte	VORTAC	LBF	117.40	N41°02'	W100°44'	3050
O Neill	VORTAC	ONL	113.90	N42°28'	W98°41'	2030
Omaha	VORTAC	OMA	116.30	N41°10'	W95°44'	1300
Pawnee City	VORTAC	PWE	112.40	N40°12'	W96°12'	1360
Scottsbluff	VORTAC	BFF	112.60	N41°53'	W103°28'	4170
Scribner	VOR	SCB	111.00	N41°36'	W96°37'	1317
Searle	VOR	SAE	110.20	N41°07'	W101°46'	3256
Sidney	VORTAC	SNY	115.90	N41°05'	W102°58'	4300
Tekamah	VOR	TQE	108.40	N41°45'	W96°10'	1030
Thedford	VOR-DME	TDD	108.60	N41°58'	W100°43'	3180
Wolbach	VORTAC	OBH	114.80	N41°22'	W98°21'	2010

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Alaby	BVN	332	N41°43'	W98°03'	1796
Anoke (LOM)	EA	272	N40°37'	W99°01'	2128
Antioch	AOQ	287	N42°00'	W102°46'	—
Aurora	AUH	278	N40°53'	W97°59'	1801
Beklof	FMZ	392	N40°35'	W97°34'	1634
Big Blue	BJU	248	N40°21'	W96°48'	1352
Brenner	FNB	404	N40°04'	W95°35'	976
Broken Bow	BBW	290	N41°26'	W99°38'	2532
Burwell	BUB	362	N41°46'	W99°08'	2180
Chappell	CNP	383	N41°04'	W102°27'	3671
Crete	CEK	420	N40°37'	W96°55'	1479
Darr	RRX	326	N40°50'	W99°51'	2455
Dawes (LOM)	CD	362	N42°45'	W103°10'	3505
Fairbury	FBY	293	N40°10'	W97°09'	1450
Flick (LOM)	PP	513	N41°24'	W95°53'	—
Fremont	FET	311	N41°27'	W96°31'	1256
Gerfi (LOM/NDB)	OM	320	N41°22'	W95°57'	987
Gering	GIG	341	N41°56'	W103°40'	4050
Gordon	GRN	414	N42°48'	W102°10'	3540
Grant	GGF	359	N40°52'	W101°43'	3412
Harry Strunk	CSB	389	N40°18'	W100°09'	2392
Hebron	HJH	323	N40°09'	W97°35'	1523
Holdrege	HDE	396	N40°26'	W99°20'	2310
Imperial	IML	283	N40°30'	W101°37'	3268
Kehoe (LOM)	GR	380	N40°52'	W98°18'	1850
Kimball	IBM	317	N41°11'	W103°40'	4897
Mc Coy	CMY	412	N43°56'	W90°38'	1020
Millard	MLE	371	N41°11'	W96°06'	1051
Ord	ODX	356	N41°37'	W98°56'	2057
Oshkosh	OKS	233	N41°24'	W102°21'	3382
Panbe (LOM/NDB)	LB	416	N41°04'	W100°34'	2722
Platte Center	PLT	407	N41°29'	W97°22'	—
Plattsmouth	PMV	329	N40°57'	W95°54'	1180
Potts (LOM/NDB)	LN	385	N40°44'	W96°45'	—
Prosser	PSS	338	N40°41'	W98°28'	1974
Rikky (LOM)	EN	426	N41°13'	W95°49'	983
Rock Co	RBE	341	N42°34'	W99°34'	2345
Seward	SWT	269	N40°51'	W97°06'	1500
Shaw	HWB	263	N40°15'	W96°45'	1250
Valentine	VTN	314	N42°51'	W100°32'	2586
Wahoo	AHQ	400	N41°14'	W96°35'	1221
Wayne	LCG	389	N42°14'	W96°59'	1431
Whitney	HIN	275	N42°49'	W103°05'	3312
Willow	DWL	353	N40°52'	W100°04'	2569
York	JYR	257	N40°53'	W97°37'	1665

Nevada

Airports

Carson City, NV – Carson

Ident	004	**ATIS**	—
Elev	4697	**Rwy/Length**	—
Lat	N39°11'		
Long	W119°44'		

Carson City, NV – Dayton Valley

Ident	NV11	**ATIS**	—
Elev	4412	**Rwy/Length**	—
Lat	N39°14'		
Long	W119°33'		

Carson City, NV – Parker Carson

Ident		**ATIS**	—
Elev	4900	**Rwy/Length**	—
Lat	N39°12'		
Long	W119°41'		

Las Vegas, NV – McCarran Intl

Ident	LAS	**ATIS**	125.60
Elev	2175	**Rwy/Length/ILS/ID**	1R/9776
Lat	N36°05'		19L/9776
Long	W115°09'		1L/5001
			19R/5001
			7R/8900
			25L/8900/111.75/IRLE
			7L/14405
			25R/14405/110.30/ILAS

Minden, NV – Douglas County

Ident	MEV	**ATIS**	—
Elev	4718	**Rwy/Length**	12/5289
Lat	N39°00'		30/5289
Long	W119°45'		16/7395
			34/7395

Reno, NV – Reno Cannon Intl

Ident	RNO	**ATIS**	124.35
Elev	4412	**Rwy/Length/ILS/ID**	07/6101
Lat	N39°29'		25/6101
Long	W119°46'		16L/9000
			34R/9000
			16R/10002/110.90/IRNO
			34L/10002/110.90/IRNO

Reno, NV – Nevada Flyers

Ident	NV18	**ATIS**	—
Elev	4600	**Rwy/Length**	—
Lat	N39°40'		
Long	W119°43'		

Reno, NV – Reno/Stead

Ident	4SD	**ATIS**	—
Elev	5046	**Rwy/Length**	08/7600
Lat	N39°40'		26/7600
Long	W119°52'		14/8080
			32/8080

Reno, NV – Reno/Tahoe Intl.

Ident	RNO	**ATIS**	135.8
Elev	4412	**Rwy/Length/ILS/ID**	16R//110.9/IRNO
Lat	N39°29'		
Long	W119°46'		

Tonopah, NV – Tonopah Test Range

Ident	XSD	**ATIS**	—
Elev	5549	**Rwy/Length**	—
Lat	N38°03'		
Long	W117°05'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Battle Mountain	VORTAC	BAM	112.20	N40°34'	W116°55'	4536
Beatty	VORTAC	BTY	114.70	N36°48'	W116°44'	2930
Boulder City	VORTAC	BLD	116.70	N35°59'	W114°51'	3650
Bullion	VORTAC	BQU	114.50	N40°45'	W115°45'	6460
Coaldale	VORTAC	OAL	117.70	N38°00'	W117°46'	4800
Ely	VOR-DME	ELY	110.60	N39°17'	W114°50'	6250
Las Vegas	VORTAC	LAS	116.90	N36°04'	W115°09'	2140
Lovelock	VORTAC	LLC	116.50	N40°07'	W118°34'	4784
Mina	VORTAC	MVA	115.10	N38°33'	W118°01'	7860
Mormon Mesa	VORTAC	MMM	114.30	N36°46'	W114°16'	2120
Mustang	VORTAC	FMG	117.90	N39°31'	W119°39'	5940
Sod House	VORTAC	SDO	114.30	N41°24'	W118°01'	4130
Tonopah	VORTAC	TPH	117.20	N38°01'	W117°02'	5330
Wells	VOR	LWL	114.20	N41°08'	W114°58'	5910
Wilson Creek	VORTAC	ILC	116.30	N38°15'	W114°23'	9318
Winnemucca	VOR-DME	INA	108.20	N40°53'	W117°48'	4299

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Mercury	MCY	326	N36°37'	W116°01'	—
Sparks	SPK	254	N39°41'	W119°46'	4570
Winnemucca	EMC	375	N40°57'	W117°50'	4303

New Hampshire

Airports

Berlin, NH – Berlin Muni

Ident	BML	**ATIS**	122.70
Elev	1158	**Rwy/Length**	18/4900
Lat	N44°34'		36/4900
Long	W71°10'		

Manchester, NH – Manchester

Ident	MHT	**ATIS**	119.55
Elev	234	**Rwy/Length/ILS/ID**	06/5847/109.10/IMHT
Lat	N42°56'		24/5847/109.10/IMHT
Long	W71°26'		17/7001
			35/7001/109.1/IMHT

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Berlin	VOR-DME	BML	110.40	N44°38'	W71°11'	1685
Concord	VORTAC	CON	112.90	N43°13'	W71°34'	710

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Keene	VORTAC	EEN	109.40	N42°47'	W72°17'	1380
Lebanon	VOR-DME	LEB	113.70	N43°40'	W72°12'	1460
Manchester	VORTAC	MHT	114.40	N42°52'	W71°22'	470
Pease	VORTAC	PSM	116.50	N43°05'	W70°49'	100

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Belknap	BLO	328	N43°32'	W71°32'	—
Chern (LOM/NDB)	AS	359	N42°49'	W71°36'	218
Claremont	CNH	233	N43°22'	W72°22'	565
Derry	DRY	338	N42°52'	W71°23'	—
Epsom (LOM/NDB)	CO	216	N43°07'	W71°27'	390
Hanover	LAH	276	N43°42'	W72°10'	—
Hornebrook	HXK	281	N44°34'	W71°10'	1158
Mahn	GMA	386	N44°21'	W71°41'	1395
Rollins	ESG	260	N43°13'	W70°49'	77
White River	IVV	379	N43°33'	W72°27'	1125

New Jersey

Airports

Atlantic City, NJ – Atlantic City Intl

Ident	ACY	**ATIS**	120.30
Elev	76	**Rwy/Length/ILS/ID**	04/6144
Lat	N39°27'		22/6144
Long	W74°34'		13/10000/109.10/IPVO
			31/10000

Caldwell, NJ – Essex Co.

Ident	CDW	**ATIS**	135.5
Elev	173	**Rwy/ILS/ID**	22/109.35/ICDW
Lat	N40°52'		
Long	W74°16'		

Lincoln Park, NJ – Lincoln Park

Ident	N07	**ATIS**	—
Elev	182	**Rwy/Length**	—
Lat	N40°56'		
Long	W74°18'		

Linden, NJ – Linden

Ident	LDJ	**ATIS**	—
Elev	23	**Rwy/Length**	—
Lat	N40°37'		
Long	W74°14'		

Matawan, NJ – Marlboro

Ident	2N8	**ATIS**	—
Elev	122	**Rwy/Length**	—
Lat	N40°21'		
Long	W74°15'		

Morristown, NJ – Morristown Muni.

Ident	MMU	**ATIS**	124.25
Elev	187	**Rwy/Length/ILS/ID**	23//110.3/IMMU
Lat	N40°47'		
Long	W74°25'		

Newark, NJ – Newark Intl.

Ident	EWR	**ATIS**	132.45
Elev	18	**Rwy/ILS/ID**	04R/108.7/IEZA
Lat	N40°47'		04L/110.75/IEWR
Long	W74°25'		22L/108.7/ILSQ
			11/109.15/IGPR

Old Bridge, NJ – Old Bridge

Ident	3N6	**ATIS**	—
Elev	87	**Rwy/Length**	—
Lat	N40°19'		
Long	W74°20'		

Teterboro, NJ – Teterboro

Ident	TEB	**ATIS**	132.02
Elev	9	**Rwy/Length/ILS/ID**	06//108.9/ITEB
Lat	N40°51'		
Long	W73°03'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Atlantic City	VORTAC	ACY	108.60	N39°27'	W74°34'	70
Broadway	VOR-DME	BWZ	114.20	N40°47'	W74°49'	1048
Cedar Lake	VORTAC	VCN	115.20	N39°32'	W74°58'	120
Colts Neck	VOR-DME	COL	115.40	N40°18'	W74°09'	120
Coyle	VORTAC	CYN	113.40	N39°49'	W74°25'	210
Mc Guire	VORTAC	GXU	110.60	N40°00'	W74°35'	120

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Robbinsville	VORTAC	RBV	113.80	N40°12'	W74°29'	250
Sea Isle	VORTAC	SIE	114.80	N39°05'	W74°48'	10
Solberg	VORTAC	SBJ	112.90	N40°34'	W74°44'	190
Sparta	VORTAC	SAX	115.70	N41°04'	W74°32'	1410
Stillwater	VOR-DME	STW	109.60	N40°59'	W74°52'	920
Teterboro	VOR-DME	TEB	108.40	N40°50'	W74°03'	10
Woodstown	VORTAC	OOD	112.80	N39°38'	W75°18'	140

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Chatham	CAT	254	N40°44'	W74°25'	255
Chesa (LOM)	EW	241	N40°35'	W74°13'	—
Lakehurst	NEL	396	N40°02'	W74°20'	144
Lizah (LOM)	EZ	204	N40°36'	W74°13'	10
Moree (LOM)	MM	392	N40°52'	W74°20'	—
Naada (LOM)	PV	336	N39°29'	W74°40'	54
Palisades Park	PPK	233	N40°49'	W73°58'	—
Paterson	PNJ	347	N40°56'	W74°09'	72
Rainbow	RNB	363	N39°25'	W75°08'	—
Torby (LOM)	TE	214	N40°48'	W74°07'	—
Trenn (LOM)	TT	369	N40°12'	W74°53'	137

New Mexico

Airports

Albuquerque, NM – Albuquerque Intl

Ident	ABQ	**ATIS**	118.00
Elev	5352	**Rwy/Length/ILS/ID**	03/9000
Lat	N35°01'		21/9000
Long	W106°37'		08/13775/111.90/ISPT
			26/13775
			12/5142
			30/5142
			17/10000
			35/10000

Santa Fe, NM – Santa Fe County Muni

Ident	SAF	**ATIS**	128.55
Elev	6344	**Rwy/Length/ILS/ID**	02/8324/111.70/ISGB
Lat	N35°37'		20/8324
Long	W106°05'		15/6304
			33/6304
			10/2905
			28/2905

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Albuquerque	VORTAC	ABQ	113.20	N35°02'	W106°48'	5740
Anton Chico	VORTAC	ACH	117.80	N35°06'	W105°02'	5450
Boles	VOR-DME	BWS	109.60	N32°49'	W106°00'	4100
Carlsbad	VORTAC	CNM	116.30	N32°15'	W104°13'	3250
Chisum	VORTAC	CME	116.10	N33°20'	W104°37'	3770
Cimarron	VORTAC	CIM	116.40	N36°29'	W104°52'	6550
Columbus	VOR-DME	CUS	111.20	N31°49'	W107°34'	4010
Corona	VORTAC	CNX	115.50	N34°22'	W105°40'	6410
Deming	VORTAC	DMN	108.60	N32°16'	W107°36'	4200
Farmington	VORTAC	FMN	115.30	N36°44'	W108°05'	5820
Gallup	VORTAC	GUP	115.10	N35°28'	W108°52'	7050
Hobbs	VORTAC	HOB	111.00	N32°38'	W103°16'	3660
Las Vegas	VORTAC	LVS	117.30	N35°39'	W105°08'	6870
Otto	VOR	OTO	114.00	N35°04'	W105°56'	6290
Pinon	VOR-DME	PIO	110.40	N32°31'	W105°18'	6580
Santa Fe	VORTAC	SAF	110.60	N35°32'	W106°03'	6260
Silver City	VORTAC	SVC	110.80	N32°38'	W108°09'	5420
Socorro	VORTAC	ONM	116.80	N34°20'	W106°49'	4910
Taos	VORTAC	TAS	117.60	N36°36'	W105°54'	7860
Truth Or Conseq	VORTAC	TCS	112.7	N33°16'	W107°16'	4900
Tucumcari	VORTAC	TCC	113.60	N35°10'	W103°35'	4070
Zuni	VORTAC	ZUN	113.40	N34°57'	W109°09'	6550

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Alamogordo	ALM	341	N32°51'	W105°58'	4210
Artesia	ATS	414	N32°51'	W104°27'	3532
Capitan	CEP	278	N33°29'	W105°24'	6561
Carlz (LOM)	CV	402	N32°16'	W104°20'	3840
Cozey (LOM)	SV	251	N32°37'	W108°03'	5350
Doman (LOM)	SG	341	N35°33'	W106°08'	5970
Dudle (LOM)	AE	308	N35°13'	W106°42'	—
Florida	FIA	329	N34°06'	W106°54'	4660
Hawke (LOM)	LR	206	N32°13'	W106°50'	4180
Hisan (LOM)	CV	335	N34°21'	W103°10'	4155
Isleta	ILT	247	N34°59'	W106°37'	5304
Lovington	LGX	396	N32°56'	W103°24'	—
Maxwell	MXR	284	N36°42'	W104°32'	6245
Portales	PRZ	407	N34°09'	W103°24'	4044
Ski	SKX	414	N36°27'	W105°40'	—
Topan (LOM/NDB)	RO	305	N33°21'	W104°26'	—

New York

Airports

Bethpage, NY – Grumman (CLOSED)

Ident		**ATIS**	—
Elev	132	**Rwy/Length**	—
Lat	N40°45'		
Long	W73°30'		

Calverton, NY – NAVWPS

Ident	CTO	**ATIS**	—
Elev	75	**Rwy/Length**	—
Lat	N40°54'		
Long	W72°48'		

East Hampton, NY – East Hampton

Ident	HTO	**ATIS**	—
Elev	55	**Rwy/Length**	—
Lat	N40°57'		
Long	W72°15'		

East Moriches, NY – Lufker

Ident	4NY7	**ATIS**	—
Elev	50	**Rwy/Length**	—
Lat	N40°49'		
Long	W72°45'		

East Moriches, NY – Spadaro

Ident	1N2	**ATIS**	—
Elev	50	**Rwy/Length**	—
Lat	N40°49'		
Long	W72°44'		

Farmingdale, NY – Farmingdale/Republic

Ident	FRG	**ATIS**	126.65
Elev	82	**Rwy/Length/ILS/ID**	01/5516
Lat	N40°43'		19/5516
Long	W73°24'		14/6827/111.9/IFRG
			32/6827

Flushing, NY – Flushing Meadows (CLOSED)

Ident	FLU	**ATIS**	—
Elev	22	**Rwy/Length**	—
Lat	N40°46'		
Long	W73°50'		

Islip, NY – Islip/Long Island MacArthur

Ident	ISP	**ATIS**	128.45
Elev	99	**Rwy/Length/ILS/ID**	06/7002/108.3/IISP
Lat	N40°47'		24/7002/108.3/IRXN
Long	W73°06'		15R/5186
			33L/5186
			15L/3212
			33R/3212
			10/5036
			28/5036

Mattituck, NY – Mattituck

Ident	21N	**ATIS**	—
Elev	30	**Rwy/Length**	—
Lat	N40°59'		
Long	W72°31'		

Montauk, NY – Montauk

Ident	MTP	**ATIS**	—
Elev	20	**Rwy/Length**	—
Lat	N41°04'		
Long	W71°55'		

New York, NY – Brooklyn CGAS (CLOSED)

Ident		**ATIS**	—
Elev	16	**Rwy/Length**	—
Lat	N40°34'		
Long	W73°53'		

New York City, NY – JF Kennedy Intl

Ident	JFK	**ATIS**	128.72
Elev	13	**Rwy/Length/ILS/ID**	4R/8400/109.5/IJFK
Lat	N40°38'		22L/8400/110.9/IIWY
Long	W73°46'		4L/11351/110.9/IHIQ
			22R/11351/109.5/IJOC
			13R/14572
			31L/14572/111.35/IMOH
			13L/10000/111.5/ITLK
			34R/10000

New York City, NY – La Guardia

Ident	LGA	**ATIS**	127.05
Elev	22	**Rwy/Length/ILS/ID**	04/7000/110.5/ILGA
Lat	N40°46'		22/7000/111.15/ITKD
Long	W73°52'		13/7000/108.5/IGDI
			31/7000/108.5/IPZV

Shirley, NY – Brookhaven

Ident	HWV	**ATIS**	—
Elev	82	**Rwy/ILS/ID**	06/108.95/IHWV
Lat	N40°49'		
Long	W72°52'		

Westhampton Beach, NY – The Gabreski

Ident	FOK	**ATIS**	—
Elev	67	**Rwy/ILS/ID**	24/111.7/IFOK
Lat	N40°50'		
Long	W72°38'		

White Plains, NY – White Plains Westchester Cty

Ident	HPN	**ATIS**	133.8
Elev	439	**Rwy/Length/ILS/ID**	11/4451
Lat	N41°03'		29/4451
Long	W73°42'		16/6548/109.7/IHPN
			34/6548/109.7/IOJZ

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Albany	VORTAC	ALB	115.30	N42°44'	W73°48'	275
Binghamton	VORTAC	CFB	112.20	N42°09'	W76°08'	1570
Buffalo	VORTAC	BUF	116.40	N42°55'	W78°38'	730
Calverton	VORTAC	CCC	117.20	N40°55'	W72°47'	86
Cambridge	VORTAC	CAM	115.00	N42°59'	W73°20'	1490
Canarsie	VOR-DME	CRI	112.30	N40°36'	W73°53'	10
Carmel	VORTAC	CMK	116.60	N41°16'	W73°34'	690
De Lancey	VOR-DME	DNY	112.10	N42°10'	W74°57'	2560
Deer Park	VORTAC	DPK	117.70	N40°47'	W73°18'	120
Dunkirk	VORTAC	DKK	116.20	N42°29'	W79°16'	680
Elmira	VOR-DME	ULW	109.65	N42°05'	W77°01'	1620
Geneseo	VORTAC	GEE	108.20	N42°50'	W77°43'	990
Georgetown	VORTAC	GGT	117.80	N42°47'	W75°49'	2040
Glens Falls	VORTAC	GFL	110.20	N43°20'	W73°36'	320
Hampton	VORTAC	HTO	113.60	N40°55'	W72°19'	30
Hancock	VORTAC	HNK	116.80	N42°03'	W75°18'	2070
Huguenot	VORTAC	HUO	116.10	N41°24'	W74°35'	1300
Ithaca	VOR-DME	ITH	111.80	N42°29'	W76°27'	1110
Jamestown	VOR-DME	JHW	114.70	N42°11'	W79°07'	1790
Kennedy	VORTAC	JFK	115.90	N40°37'	W73°46'	11
Kingston	VORTAC	IGN	117.60	N41°39'	W73°49'	580
La Guardia	VOR-DME	LGA	113.10	N40°47'	W73°52'	15
Massena	VORTAC	MSS	114.10	N44°54'	W74°43'	200
Pawling	VORTAC	PWL	114.30	N41°46'	W73°36'	1250
Plattsburgh	VORTAC	PLB	116.90	N44°41'	W73°31'	344
Rochester	VORTAC	ROC	110.00	N43°07'	W77°40'	550
Rockdale	VORTAC	RKA	112.60	N42°27'	W75°14'	2032
Romulus	VOR-DME	RYK	108.40	N42°42'	W76°52'	635
Saranac Lake	VOR-DME	SLK	109.20	N44°23'	W74°12'	1650
Syracuse	VORTAC	SYR	117.00	N43°09'	W76°12'	420
Utica	VORTAC	UCA	111.20	N43°01'	W75°09'	1420
Watertown	VORTAC	ART	109.80	N43°57'	W76°03'	370
Wellsville	VORTAC	ELZ	111.40	N42°05'	W77°59'	2300

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Alpine	ALP	245	N42°14'	W76°45'	—
Avon	AVN	344	N43°00'	W77°46'	—
Babylon	BBN	275	N40°40'	W73°23'	—
Bethpage	BPA	248	N40°45'	W73°26'	—
Breit (LOM)	RO	400	N43°07'	W77°33'	—
Bridge	OGY	414	N40°34'	W73°52'	10
Briel (LOM)	SL	395	N44°28'	W74°07'	1677
Clay	CJY	275	N43°03'	W75°15'	—
Conda (LOM/NDB)	JF	373	N40°35'	W73°47'	12
Drum	GTB	257	N44°04'	W75°44'	609
Frikk (LOM)	FR	407	N40°46'	W73°28'	146
Ganse (LOM)	GF	209	N43°15'	W73°36'	—
Grimm (LOM)	RT	268	N40°35'	W73°39'	—
Halos (LOM/NDB)	EL	269	N42°06'	W77°54'	2103
Hawky (LOM)	AL	219	N42°49'	W73°48'	—
Hestr (LOM)	HP	281	N41°08'	W73°45'	501
Hunter	HEU	356	N42°51'	W73°56'	378
Johnstown	JJH	523	N42°59'	W74°19'	867
Kathi (LOM)	IA	329	N43°06'	W78°50'	—
Kirki (LOM)	SY	242	N43°06'	W76°00'	403
Klump (LOM)	BU	231	N43°00'	W78°39'	630
Kring (LOM)	OZ	279	N42°35'	W74°59'	1573
Lokks (LOM)	IS	366	N40°43'	W73°11'	78
Lorrs (LOM)	IW	226	N40°43'	W73°41'	—
Meier (LOM/NDB)	PO	403	N41°34'	W73°57'	9
Misse (LOM)	MS	278	N44°51'	W74°54'	240
Monga (LOM/NDB)	MS	359	N41°45'	W74°51'	1330
Neely (LOM/NDB)	SW	335	N41°29'	W74°13'	420
Ogive (LOM)	OG	358	N44°42'	W75°21'	355
Olean	LYS	360	N42°17'	W78°20'	—
Orchy (LOM)	UR	385	N40°51'	W73°48'	10
Otims (LOM)	MG	353	N41°26'	W74°17'	378
Peconic	PIC	339	N40°48'	W72°54'	—
Penn Yan	PYA	260	N42°38'	W77°03'	858
Peths (LOM)	LG	332	N40°42'	W73°55'	—
Philmont	PFH	272	N42°15'	W73°43'	—
Plazz (LOM)	GB	204	N42°52'	W78°48'	—
Plein (LOM/NDB)	BK	329	N43°13'	W75°28'	450
Potsdam	PTD	400	N44°43'	W74°52'	—

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Seneca	SSN	208	N42°44'	W76°54'	—	
Smite (LOM)	BG	332	N42°06'	W75°53'	860	
Squir (LOM)	FO	400	N40°54'	W72°33'	—	
Stanwyck	SKU	261	N41°31'	W74°02'	520	
Varna (LOM)	IT	266	N42°25'	W76°22'	1504	

North Carolina

Airports

Raleigh/Durham, NC – Raleigh-Durham

Ident	RDU	**ATIS**	123.80
Elev	436	**Rwy/Length/ILS/ID**	5R/7500/109.50/IRDU
Lat	N35°53'		23L/7500/108.50/ILEI
Long	W78°47'		5L/10000/109.10/IGKK
			23R/10000/111.70/IDMP
			14/3700
			32/3700

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Barretts Mountain	VOR-DME	BZM	110.80	W81°14'	N35°52'	1880
Charlotte	VOR-DME	CLT	115.00	N35°11'	W80°57'	733
Cherry Point	VOR	NKT	112.80	N34°54'	W76°52'	72
Cofield	VORTAC	CVI	114.60	N36°22'	W76°52'	70
Elizabeth City	VOR-DME	ECG	112.50	N36°15'	W76°10'	10
Fayetteville	VOR-DME	FAY	108.80	N34°59'	W78°52'	180
Greensboro	VORTAC	GSO	116.20	N36°02'	W79°58'	880
Kinston	VORTAC	ISO	109.60	N35°22'	W77°33'	70
Kirksville	VORTAC	IRK	114.60	N40°08'	W92°35'	70
Liberty	VORTAC	LIB	113.00	N35°48'	W79°36'	830
Lumberton	VOR	LBT	110.00	N34°36'	W79°03'	130
New Bern	VOR-DME	EWN	113.60	N35°04'	W77°02'	10
Raleigh/Durham	VORTAC	RDU	117.20	N35°52'	W78°46'	430
Rowan	VOR-DME	RUQ	111.00	N35°38'	W80°31'	770
Sandhills	VORTAC	SDZ	111.80	N35°12'	W79°35'	590
Simmons	VOR	FBG	109.80	N35°07'	W78°54'	240
Sugarloaf	VORTAC	SUG	112.20	N35°24'	W82°16'	3970
Tar River	VORTAC	TYI	117.80	N35°58'	W77°42'	70
Wilmington	VORTAC	ILM	117.00	N34°21'	W77°52'	20
Wright Brothers	VOR-DME	RBX	111.60	N35°55'	W75°41'	10

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Ahoskie	ASJ	415	N36°17'	W77°10'	218
Airli (LOM)	IL	281	N34°11'	W77°51'	—
Alwood	AQE	230	N35°42'	W77°22'	—
Anson Co	AFP	283	N35°01'	W80°04'	302
Ashee (LOM/NDB)	JU	410	N36°26'	W81°19'	3123
Broad River	BRA	379	N35°16'	W82°28'	—
Burlington	BUY	329	N36°02'	W79°28'	605
Camp	CPC	227	N34°16'	W78°42'	90
Carolina Beach	CLB	216	N34°06'	W77°57'	—
Cherry Point Mc	NKT	245	N34°50'	W76°48'	—
Chocowinity	RNW	388	N35°30'	W77°06'	40
City Lake	CQJ	266	N35°42'	W79°51'	750
Clinton	CTZ	412	N34°58'	W78°21'	—
Davie	DVZ	354	N35°54'	W80°27'	810
Dixon	DIW	198	N34°34'	W77°27'	54
Doone (LOM)	GR	367	N34°54'	W78°56'	170
Dorchester Co	DYB	365	N33°03'	W80°16'	100
Edenton	EDE	265	N36°01'	W76°33'	—
Elizabethtown	TGQ	398	N34°31'	W78°30'	115
Ellas (LOM)	OA	261	N34°45'	W77°42'	65
Fiddlers	FIQ	391	N35°42'	W81°40'	1140
First River	SLP	368	N35°15'	W81°35'	850
Fort Bragg	FGP	393	N35°08'	W78°48'	—
Greon (LOM)	RD	382	N35°47'	W78°52'	—
Harnett	HQT	417	N35°25'	W78°40'	—
Hemlock	BAR	320	N36°09'	W81°52'	—
Huntsboro	HXO	271	N36°18'	W78°37'	491
Jambe (LOM/NDB)	RW	235	N35°46'	W77°57'	150
Jigel	JB	384	N34°32'	W79°08'	135
Jnail	EUU	251	N35°36'	W78°21'	250
Katfi (LOM)	EW	362	N35°01'	W77°04'	35
Keans (LOM)	IM	357	N35°31'	W82°35'	2165
Kenan	DPL	344	N35°02'	W77°56'	—
Lee Co	EEJ	428	N35°22'	W79°13'	—
Leevy (LOM/NDB)	LE	350	N35°55'	W78°43'	500
Lincolnton	IZN	432	N35°32'	W81°05'	910
Mackall	HFF	278	N35°01'	W79°29'	—
Manteo	MQI	370	N35°54'	W75°41'	10
Marky (LOM)	GS	254	N36°10'	W80°02'	938
Maxtn	ME	257	N34°44'	W79°26'	200
Mohall	HBC	350	N48°45'	W101°32'	1648
Morehead	MRH	269	N34°43'	W76°39'	5
Mount Airy	AXI	284	N36°27'	W80°33'	1037
New River (Marine)	NCA	356	N34°43'	W77°25'	—
Pamlico	OUC	404	N35°06'	W75°59'	9
Pendy	ACZ	379	N34°42'	W78°00'	30
Person (LOM/NDB)	HUR	220	N36°13'	W79°03'	625
Plymouth	PMZ	221	N35°48'	W76°45'	38
Pope (LOM/NDB)	POB	338	N35°13'	W78°57'	—

Location/Name	Ident	Freq	Lat	Long	Elev
Rapids	RZZ	407	N36°26'	W77°42'	259
Reeno (LOM)	IN	317	N36°04'	W80°10'	—
Robeson	RSY	359	N34°36'	W79°03'	—
Roscoe	RCZ	375	N34°51'	W79°41'	350
Rutherford	RFE	344	N35°20'	W81°57'	925
Salisbury	SRW	233	N35°40'	W80°30'	771
Slammer	SIF	423	N36°22'	W79°45'	856
Stals (LOM)	IS	401	N35°14'	W77°41'	40
Stanly Co	SWY	362	N35°24'	W80°09'	602
Statesville	SVH	404	N35°50'	W80°55'	—
Stonia	GHJ	293	N35°11'	W81°09'	750
Swearing	SEN	260	N35°46'	W80°17'	685
Tawba (LOM/NDB)	HK	332	N35°47'	W81°18'	975
Tomotla	TTQ	335	N35°06'	W83°57'	1855
Tryon (LOM)	CL	242	N35°09'	W81°01'	691
Wayne (LOM/NDB)	JYN	208	N35°31'	W77°54'	126
Wesley	TWL	204	N34°57'	W80°42'	660
Wilki (LOM/NDB)	UK	209	N36°06'	W81°05'	1380
Williamston	MCZ	336	N35°51'	W77°10'	76
Woodville	LLW	254	N36°15'	W76°17'	—
Yaupon	SUT	233	N33°55'	W78°04'	20
Zephyr	ZEF	326	N36°18'	W80°43'	—

North Dakota

Airports

Bismark, ND – Bismark Muni

Ident	BIS	**ATIS**	119.35
Elev	1677	**Rwy/Length/ILS/ID**	03/5107
Lat	N46°46'		21/5107
Long	W100°44'		13/8794/111.50/IBZX
			31/8794/110.30/IBIS
			17/4009
			35/4009

Grand Forks, ND – Grand Forks Intl

Ident	GFK	**ATIS**	119.40
Elev	844	**Rwy/Length/ILS/ID**	08/4200
Lat	N47°57'		26/4200
Long	W97°10'		17R/1349
			35L/1349/109.10/IFGK
			17L/3900
			35R/3900

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Bismarck	VOR-DME	BIS	116.50	N46°45'	W100°39'	1840
Deering	VOR	MIB	114.90	N48°24'	W117°25'	1668
Devils Lake	VORTAC	DVL	111.00	N48°06'	W98°54'	1450
Dickinson	VORTAC	DIK	112.90	N46°51'	W102°46'	2520
Fargo	VORTAC	FAR	116.20	N46°45'	W96°51'	910
Grand Forks	VOR-DME	GFK	114.30	N47°57'	W97°11'	840
Hazen	VORTAC	HZN	114.10	N39°30'	W118°59'	1786
Jamestown	VOR-DME	JMS	114.50	N46°55'	W98°40'	1490
Minot	VORTAC	MOT	117.10	N48°15'	W101°17'	1690
Williston	VORTAC	ISN	116.30	N48°15'	W103°45'	2372

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Bowman	BOD	374	N46°11'	W103°25'	2960
Breckenridge-Wa	BWP	233	N46°14'	W96°36'	966
Colij (LOM/NDB)	BI	230	N46°41'	W100°38'	—
Gwinner	GWR	278	N46°13'	W97°38'	1250
Hazen	HZE	205	N47°17'	W101°34'	1786
Hettinger	HEI	392	N46°01'	W102°38'	2714
Kenie (LOM/NDB)	AA	365	N47°00'	W96°48'	887
Noson (LOM)	DI	353	N46°41'	W102°42'	2527
Parshall	PSH	379	N47°56'	W102°08'	1998
Rugby	RUG	212	N48°23'	W100°01'	—
Sabon (LOM)	JM	395	N46°51'	W98°34'	—
Valley City	VCY	382	N46°52'	W97°54'	1440
Watford City	AFD	400	N47°47'	W103°15'	2066
Yuson (LOM)	SF	275	N48°07'	W103°30'	2264

Ohio

Airports

Cincinnati, OH – Cincinnati Muni-Lunken Field

Ident	LUK	**ATIS**	120.25
Elev	484	**Rwy/Length/ILS/ID**	2R/6102/110.90/ILUK
Lat	N39°06'		20L/6102
Long	W84°25'		2L/3802
			20R/3802
			06/5128
			24/5128

Columbus, OH – Port Columbus Intl

Ident	CMH	**ATIS**	124.60
Elev	815	**Rwy/Length/ILS/ID**	05/4483
Lat	N39°59'		23/4483
Long	W82°52'		10R/10250/108.70/IAQI
			28L/10250/108.70/ICMH
			10L/6000/109.10/ICBP
			28R/6000

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Akron	VOR-DME	ACO	114.40	N41°06'	W81°12'	1200
Allen Co	VORTAC	AOH	108.40	N40°42'	W83°58'	980
Appleton	VORTAC	APE	116.70	N40°09'	W82°35'	1360
Bellaire	VORTAC	AIR	117.10	N40°01'	W80°49'	1290
Briggs	VORTAC	BSV	112.40	N40°44'	W81°25'	1230
Buckeye	VOR	BUD	109.80	N40°36'	W83°03'	991
Chardon	VORTAC	CXR	112.70	N41°31'	W81°09'	1330
Cincinnati	VORTAC	CVG	117.30	N39°00'	W84°42'	880
Dayton	VOR-DME	DQN	114.50	N40°00'	W84°23'	990
Dryer	VORTAC	DJB	113.60	N41°21'	W82°09'	780
Findlay	VORTAC	FDY	108.20	N40°57'	W83°45'	820
Jefferson	VORTAC	JFN	115.20	N41°45'	W80°44'	900
Lost Nation	VOR-DME	LNN	110.20	N41°41'	W81°23'	624
Mansfield	VORTAC	MFD	108.80	N40°52'	W82°35'	1210
Marathon	VOR	MAH	114.90	N41°00'	W83°39'	812
Midwest	VOR-DME	MXQ	112.90	N39°25'	W83°48'	1050
Newcomerstown	VORTAC	CTW	111.80	N40°13'	W81°28'	1180
Patterson	VORTAC	FFO	115.20	N39°49'	W84°03'	810
Rosewood	VORTAC	ROD	117.50	N40°17'	W84°02'	1083
Sandusky	VOR-DME	SKY	109.20	N41°26'	W82°39'	580
Springfield	VOR-DME	SGH	113.20	N39°50'	W83°50'	1050
Tiverton	VOR-DME	TVT	116.50	N40°27'	W82°07'	1340
Waterville	VOR-DME	VWV	113.10	N41°27'	W83°38'	660
Yellow Bud	VOR	XUB	112.50	N39°31'	W82°58'	690
Youngstown	VORTAC	YNG	109.00	N41°19'	W80°40'	1140
Zanesville	VOR-DME	ZZV	111.40	N39°56'	W81°53'	900

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Addys (LOM)	SI	351	N39°07'	W84°40'	—
Airbo (LOM/NDB)	IL	407	N39°29'	W83°44'	1056
Akron (LOM/NDB)	AK	362	N41°04'	W81°23'	—
Ashland	AAU	329	N40°57'	W82°15'	1206
Benton Ridge	BNR	209	N41°01'	W83°39'	800
Boutn (LOM/NDB)	BU	230	N39°49'	W83°12'	900
Bruny (LOM)	AT	315	N39°50'	W84°20'	934
Bryan	BYN	260	N41°28'	W84°27'	—
Burke Lakefront	BKL	416	N41°31'	W81°39'	581
Burln (LOM/NDB)	UR	321	N39°02'	W84°46'	—
Cadiz	CFX	239	N40°14'	W81°00'	1158
Cambridge	CDI	223	N39°57'	W81°35'	855
Caser (LOM)	LH	338	N39°44'	W82°32'	960
Cincinnati	LUK	335	N39°09'	W84°20'	871
Cincinnati-Blue	ISZ	388	N39°14'	W84°23'	839
Circleville	CYO	366	N39°31'	W82°58'	680
Clark Co	CCJ	341	N39°52'	W83°46'	1012
Cobbs (LOM)	DD	253	N39°44'	W83°01'	732
Court House	CSS	414	N39°35'	W83°23'	993
Cubla (LOM/NDB)	HW	299	N39°21'	W83°52'	998
Defiance	DFI	246	N41°20'	W84°25'	—
Delaware	DLZ	215	N40°16'	W83°06'	945
Don Scott	DKG	348	N40°04'	W83°04'	—
East Liverpool	EVO	385	N40°40'	W80°38'	1099
Engel	EZE	226	N41°29'	W81°43'	617
Fetch (LOM)	YN	338	N41°12'	W80°35'	1127
Fostoria	FZI	379	N41°11'	W83°23'	—
Fuler (LOM/NDB)	OS	515	N40°04'	W83°11'	940
Fulton	USE	375	N41°36'	W84°07'	779
Gallipolis	GAS	420	N38°50'	W82°09'	560
Georgetown	GEO	219	N38°52'	W83°53'	954
Grens (LOM)	CB	272	N40°00'	W83°01'	—
Hamilton	HAO	260	N39°22'	W84°34'	668
Harri (LOM/NDB)	CL	344	N41°20'	W81°57'	800
Hillsboro	HOC	278	N39°11'	W83°32'	923
Hogaf (LMM)	GF	521	N41°34'	W81°28'	870
Hook Fld	HKF	239	N39°29'	W84°26'	651
Hubbard	HBD	408	N41°09'	W80°31'	—
Lakefield	CQA	205	N40°28'	W84°33'	892
Lima	LYL	362	N40°42'	W84°01'	971
London	UYF	284	N39°56'	W83°27'	1070
Madeira	MDE	379	N39°13'	W84°21'	790
Manns (LOM/NDB)	MF	372	N40°45'	W82°26'	—
Marion	MNN	201	N40°37'	W83°04'	991
Marysville	MRT	303	N40°13'	W83°20'	1284
Millersburg	MLR	382	N40°32'	W81°52'	1145
Newark	HEH	524	N40°01'	W82°27'	875
Onida (LOM)	MW	223	N39°34'	W84°19'	685
Ottawa	PDR	233	N41°01'	W83°58'	760
Oxford	OXD	282	N39°30'	W84°46'	1030
Pickl (LOM)	LC	376	N39°52'	W82°50'	—
Port Clinton	PCW	423	N41°31'	W82°52'	586
Portsmouth	PMH	373	N38°46'	W82°50'	664
Ross Co	RZT	236	N39°26'	W83°01'	724
Rushsylvania	RUV	326	N40°27'	W83°40'	1220
Smithville	SLW	400	N40°52'	W81°49'	1140
Sportys	PWF	245	N39°04'	W84°12'	848
Stanley	VFU	411	N40°51'	W84°36'	780
Sumie (LOM/NDB)	CM	391	N39°59'	W82°45'	—
Tabey (LOM)	BF	248	N41°34'	W81°34'	—
Tiffin	TII	269	N41°05'	W83°12'	784

Location/Name	Ident	Freq	Lat	Long	Elev
Tolson	TSO	395	N40°33'	W81°04'	—
Tophr (LOM)	TO	219	N41°33'	W83°55'	—
University	UGS	250	N39°15'	W82°07'	754
Versailles	VES	356	N40°12'	W84°31'	1005
West Union	AMT	359	N38°51'	W83°33'	886
Xenia	XEN	395	N39°42'	W83°55'	—
Zanesville	ZZV	204	N39°54'	W81°55'	850

Oklahoma

Airports

Oklahoma City, OK – Will Rogers World

Ident	OKC	**ATIS**	125.85
Elev	1295	**Rwy/Length/ILS/ID**	13/7800
Lat	N35°23'		31/7800
Long	W97°36'		17R/9800/110.70/IOKC
			35L/9800
			17L/9802
			35R/9802/110.90/IRGR
			18/3077
			36/3077

Oklahoma City, OK – Page Muni.

Ident	F29	**ATIS**	—
Elev	1353	**Rwy/Length**	—
Lat	N35°29'		
Long	W97°49'		

Oklahoma City, OK – Wiley Post

Ident	PWA	**ATIS**	128.72
Elev	1299	**Rwy/Length/ILS/ID**	03/3409
Lat	N35°32'		21/3409
Long	W97°38'		13/4213
			31/4213
			17R/4232
			35L/4232
			17L/7198/108.70/IPWA
			35R/7198

Tulsa, OK – Tulsa Intl

Ident	TUL	**ATIS**	124.90
Elev	677	**Rwy/Length/ILS/ID**	08/7695
Lat	N36°11'		26/7695
Long	W95°53'		18L/10000/109.70/IDWE
			36R/10000/110.30/ITUL
			18R/6101/111.10/ITJY
			36L/6101/111.10/ITJY

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Ada	VOR-DME	ADH	117.80	N34°48'	W96°40'	987
Altus	VORTAC	LTS	109.80	N34°39'	W99°16'	1370
Ardmore	VORTAC	ADM	116.70	N34°12'	W97°10'	925
Bartlesville	VOR-DME	BVO	117.90	N36°50'	W96°01'	940
Burns Flat	VORTAC	BFV	110.00	N35°14'	W99°12'	1780
Davis	VOR	MEE	108.60	N35°39'	W95°22'	932
Duncan	VOR-DME	DUC	111.00	N34°23'	W97°55'	1090
Gage	VORTAC	GAG	115.60	N36°20'	W99°52'	2430
Glenpool	VOR-DME	GNP	110.60	N35°55'	W95°58'	810
Hobart	VORTAC	HBR	111.80	N34°51'	W99°03'	1460
Kingfisher	VORTAC	IFI	114.70	N35°48'	W98°00'	1112
Lawton	VOR-DME	LAW	109.40	N34°29'	W98°24'	1100
Mc Alester	VORTAC	MLC	112.00	N34°50'	W95°46'	820
Okmulgee	VOR	OKM	112.20	N35°41'	W95°51'	766
Pioneer	VORTAC	PER	113.20	N36°44'	W97°09'	1060
Rich Mountain	VORTAC	PGO	113.50	N34°40'	W94°36'	2700
Sayre	VORTAC	SYO	115.20	N35°20'	W99°38'	1990
Stillwater	VOR-DME	SWO	108.40	N36°13'	W97°04'	1020
Tinker	VORTAC	TIK	115.80	N35°26'	W97°22'	1283
Tulsa	VORTAC	TUL	114.40	N36°11'	W95°47'	790
Vance	VORTAC	END	115.40	N36°20'	W97°55'	1304
Wiley Post	VOR-DME	PWA	113.40	N35°31'	W97°38'	1270
Will Rogers	VORTAC	IRW	114.10	N35°21'	W97°36'	1230
Woodring	VOR-DME	ODG	109.00	N36°22'	W97°47'	1150

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Ada	AMR	302	N34°48'	W96°40'	1008
Addmo (LOM)	AI	400	N34°13'	W96°55'	715
Alva	AVK	203	N36°46'	W98°40'	—
Antlers	AEE	391	N34°11'	W95°39'	569
Arbuckle	AUV	284	N34°09'	W97°07'	840
Blaki (LOM)	SW	255	N36°14'	W97°05'	975
Bristow	TZO	251	N35°46'	W96°25'	929
Buffalo	BFK	215	N36°51'	W99°37'	1819
Chickasha	OLR	290	N35°06'	W97°58'	1142
Clinton	CLK	320	N35°32'	W98°56'	—
Cushing	CUH	242	N35°53'	W96°46'	—
Dewie (LOM)	BV	201	N36°50'	W96°00'	893
Durant	DUA	359	N33°56'	W96°23'	684
El Reno	RQO	335	N35°28'	W98°00'	1418
Elk City	EZY	241	N35°25'	W99°23'	1971
Fairview	FAU	246	N36°17'	W98°28'	—
Fossi (LOM/NDB)	BZ	393	N35°27'	W99°12'	1740

Location/Name	Ident	Freq	Lat	Long	Elev
Frederick	FDR	222	N34°21'	W98°59'	—
Gally (LOM/NDB)	RG	350	N35°17'	W97°35'	1198
Garfy (LOM)	EI	341	N36°16'	W97°47'	1100
Guymon	GUY	275	N36°42'	W101°30'	—
Henryetta	HET	267	N35°24'	W96°00'	—
Holdenville	HDL	411	N35°05'	W96°24'	862
Hugo	HHW	323	N34°02'	W95°32'	546
Idabel	IBO	271	N33°54'	W94°50'	508
Logan Co	LCY	326	N35°50'	W97°24'	1074
Miami	MMW	317	N36°54'	W94°53'	—
Mooreland	MDF	284	N36°29'	W99°11'	1955
Muskogee	MKO	306	N35°35'	W95°17'	—
Norman	OUN	260	N35°14'	W97°28'	—
Owaso (LOM/NDB)	DW	375	N36°18'	W95°52'	—
Pauls Valley	PVJ	384	N34°42'	W97°13'	—
Ponca (LOM/NDB)	PN	275	N36°49'	W97°06'	1038
Post	PFL	308	N34°36'	W98°24'	—
Prague	GGU	314	N35°31'	W96°43'	925
Preso (LOM)	OK	388	N35°45'	W95°56'	740
Sallisaw	IQS	520	N35°23'	W94°47'	805
Seminole	SRE	278	N35°16'	W96°40'	1007
Shawnee	SNL	227	N35°21'	W96°56'	1055
Tahlequah	TQH	215	N35°55'	W95°00'	—
Thorp	BCY	212	N36°45'	W102°32'	4172
Tilghman	CQB	396	N35°43'	W96°49'	967
Trail	OFZ	388	N34°46'	W98°24'	—
Tuloo (LOM/NDB)	OK	406	N35°28'	W97°36'	—
Wampa (LOM)	ML	344	N34°47'	W95°49'	739
Watonga	JWG	299	N35°51'	W98°25'	1530
Weatherford	OJA	272	N35°31'	W98°40'	1581
West Woodward	OWU	329	N36°26'	W99°31'	2167
William Pogue	OWP	362	N36°10'	W96°09'	878

Oregon

Airports

Portland, OR – Portland Intl

Ident	PDX	**ATIS**	128.35
Elev	26	**Rwy/Length/ILS/ID**	02/7000
Lat	N45°35'		20/7000/108.90/IGPO
Long	W122°36'		10R/11000/109.90/IPDX
			28L/11000
			10L/8000
			28R/8000/111.30/IIAP

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Astoria	VOR-DME	AST	114.00	N46°09'	W123°52'	10
Baker	VORTAC	BKE	115.30	N44°50'	W117°48'	3361
Columbia	VOR	CBU	109.20	N45°35'	W122°36'	19
Corvallis	VOR-DME	CVO	115.40	N44°29'	W123°17'	250
Deschutes	VORTAC	DSD	117.60	N44°15'	W121°18'	4100
Eugene	VORTAC	EUG	112.90	N44°07'	W123°13'	360
Kimberly	VORTAC	IMB	115.60	N44°38'	W119°42'	5220
Klamath Falls	VORTAC	LMT	115.90	N42°09'	W121°43'	4087
Klickitat	VORTAC	LTJ	112.30	N45°42'	W121°06'	3220
Lakeview	VORTAC	LKV	112.00	N42°29'	W120°30'	7460
Newberg	VORTAC	UBG	117.40	N45°21'	W122°58'	1440
Newport	VORTAC	ONP	117.10	N44°34'	W124°03'	150
North Bend	VORTAC	OTH	112.10	N43°24'	W124°10'	680
Pendleton	VORTAC	PDT	114.70	N45°41'	W118°56'	1556
Portland	VOR-DME	PDX	111.80	N45°35'	W122°36'	20
Rogue Valley	VORTAC	OED	113.60	N42°28'	W122°54'	2080
Rome	VORTAC	REO	112.50	N42°35'	W117°52'	4040
Roseburg	VOR-DME	RBG	108.20	N43°10'	W123°21'	1320
Wildhorse	VOR-DME	ILR	113.80	N43°35'	W118°57'	4140

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Abate (LOM)	HI	356	N45°37'	W123°02'	208
Bodey (LOM/NDB)	RD	411	N44°18'	W121°01'	3009
Emire (LOM/NDB)	OT	378	N43°23'	W124°18'	30
Foris (LOM/NDB)	PD	230	N45°41'	W118°43'	1185
Frakk (LOM)	EU	260	N44°12'	W123°13'	—
Gold Beach	GOL	396	N42°25'	W124°25'	—
Goose	GOS	278	N42°09'	W120°24'	4717
Karpen	PEN	201	N46°08'	W123°35'	722
La Grande	LGD	296	N45°22'	W117°59'	2735
Laker (LOM/NDB)	IA	332	N45°32'	W122°27'	—
Lewisburg	LWG	225	N44°36'	W123°16'	330
Mc Dermitt State	RMD	204	N42°00'	W117°43'	4430
Merrill	LFA	347	N41°59'	W121°38'	4090
Minne (LOM)	MM	383	N45°14'	W123°01'	159
Ontario	ONO	305	N44°01'	W117°00'	—
Prahl	PLV	366	N45°17'	W122°46'	157
Pumie (LOM)	MF	373	N42°27'	W122°54'	1175
Roseburg	RBG	400	N43°14'	W123°21'	—
Turno (LOM)	SL	266	N44°50'	W122°56'	—
Viole (LMM)	FR	356	N42°23'	W122°52'	—
Wilson	TKW	271	N45°29'	W123°51'	20

Pennsylvania

Airports

Philadelphia, PA – Philadelphia Intl

Ident	PHL	**ATIS**	133.40
Elev	21	**Rwy/Length/ILS/ID**	9R/10499/109.30/IPHL
Lat	N39°52'		27L/10499/109.30/IGLC
Long	W75°14'		9L/9500/108.95/IVII
			27R/9500/108.95/IPDP
			17/5459
			35/5459

Pittsburgh, PA – Pittsburgh Intl

Ident	PIT	**ATIS**	127.25
Elev	1203	**Rwy/Length/ILS/ID**	10R/11500/108.90/IGUT
Lat	N40° 29'		28L/11500/108.90/IPFS
Long	W80°13'		10C/8039
			28C/8039
			10L/10502/111.70/ILXB
			28R/10502/111.70/IHFE
			14/8100
			32/8100

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Allegheny	VORTAC	AGC	110.00	N40°16'	W80°02'	1290
Allentown	VORTAC	FJC	117.50	N40°43'	W75°27'	680
Altoona	VOR	AOO	108.80	N40°19'	W78°18'	1630
Bradford	VORTAC	BFD	116.60	N41°47'	W78°37'	2100
Clarion	VORTAC	CIP	112.90	N41°08'	W79°27'	1530
East Texas	VORTAC	ETX	110.20	N40°34'	W75°41'	750
Ellwood City	VORTAC	EWC	115.80	N40°49'	W80°12'	1220
Erie	VORTAC	ERI	109.40	N42°01'	W80°17'	800
Franklin	VOR	FKL	109.60	N41°26'	W79°51'	1530
Harrisburg	VORTAC	HAR	112.50	N40°18'	W77°04'	1301
Hazleton	VOR	HZL	109.40	N40°58'	W76°07'	1710
Indian Head	VORTAC	IHD	108.20	N39°58'	W79°21'	2820
Johnstown	VORTAC	JST	113.00	N40°19'	W78°50'	2280
Keating	VORTAC	ETG	116.00	N41°12'	W78°08'	2250
Lake Henry	VORTAC	LHY	110.80	N41°28'	W75°28'	2320
Lancaster	VORTAC	LRP	117.30	N40°07'	W76°17'	400
Milton	VORTAC	MIP	109.20	N41°01'	W76°39'	1000
Modena	VORTAC	MXE	113.20	N39°55'	W75°40'	474
Montour	VORTAC	MMJ	112.00	N40°29'	W80°11'	1200
North Philadelphi	VOR	PNE	112.00	N40°04'	W75°00'	110
Pennridge	VOR-DME	CKZ	108.85	N40°23'	W75°17'	552
Philipsburg	VORTAC	PSB	115.50	N40°54'	W77°59'	2450
Pottstown	VORTAC	PTW	116.50	N40°13'	W75°33'	290
Ravine	VORTAC	RAV	114.60	N40°33'	W76°35'	1750
Revloc	VOR-DME	REC	110.60	N40°32'	W78°44'	2340
Saint Thomas	VORTAC	THS	115.00	N39°56'	W77°57'	2338
Selinsgrove	VORTAC	SEG	110.40	N40°47'	W76°53'	620
Slate Run	VORTAC	SLT	113.90	N41°30'	W77°58'	2310
Stoneyfork	VORTAC	SFK	108.60	N41°41'	W77°25'	1990
Tidioute	VORTAC	TDT	117.60	N41°42'	W79°25'	10
Tyrone	VORTAC	TON	114.90	N40°44'	W78°19'	2630
Wilkes Barre	VORTAC	LVZ	111.60	N41°16'	W75°41'	2120
Williamsport	VORTAC	FQM	114.40	N41°20'	W76°46'	2090
Yardley	VORTAC	ARD	108.20	N40°15'	W74°54'	300

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Ambler	ING	275	N40°07'	W75°17'	—
Barly (LOM)	AV	257	N41°16'	W75°46'	994
Bellgrove	BZJ	328	N40°26'	W76°33'	518
Benje	BHU	382	N40°22'	W79°16'	1180
Brafo (LOM/NDB)	BF	224	N41°45'	W78°34'	2143
Camor (LOM/NDB)	VV	299	N39°52'	W79°44'	1020
Carbon	LQX	339	N40°48'	W75°45'	512
Cascade	CQD	372	N42°07'	W80°06'	—
Castle	UCP	272	N41°01'	W80°24'	—
Corry	ORJ	258	N41°54'	W79°38'	—
Crystal Lake	CYE	410	N41°12'	W75°49'	—
Doylestown	DYL	237	N40°20'	W75°07'	—
Enola (LOM)	MD	204	N40°14'	W76°54'	—
Esmer (LOM)	ER	349	N42°02'	W80°15'	—
Googl (LOM)	PT	264	N40°14'	W75°26'	330
Indiana	INP	242	N40°37'	W79°03'	—
Latle (LOM)	CX	219	N40°10'	W77°00'	—
Leehi (LOM)	AB	400	N40°35'	W75°32'	—
Penue (LOM)	UN	388	N40°54'	W77°44'	943
Picture Rocks	PIX	344	N41°16'	W76°42'	—
Ports (LOM)	PS	275	N40°59'	W78°08'	—
Quakertown	UKT	208	N40°25'	W75°17'	—
Shapp (LOM)	RD	356	N40°18'	W75°56'	—
Speez (LOM)	PD	222	N39°54'	W75°05'	—
Stoystown	SYS	209	N40°05'	W78°54'	—
Stroh (LOM/NDB)	RV	407	N40°36'	W77°43'	—
Washington Co	PNU	255	N40°08'	W80°09'	1363
Willow Grove	NXX	388	N40°11'	W75°08'	350
York	EUD	285	N39°55'	W76°52'	523

Rhode Island

Airports

Block Island, RI – Block Island State

Ident	BID	**ATIS**	—
Elev	109	**Rwy/Length**	10/2501
Lat	N41°10'		28/2501
Long	W71°34'		

Providence, RI – T Francis Green

Ident	PVD	**ATIS**	124.20
Elev	55	**Rwy/Length/ILS/ID**	05/7166/109.30/IPVD
Lat	N41°43'		23/7166/109.30/IARJ
Long	W71°25'		16/6081
			34/6081/111.50/IUNQ

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Providence	VORTAC	PVD	115.60	N41°43'	W71°25'	50
Sandy Point	VOR-DME	SEY	117.80	N41°10'	W71°34'	100

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Armin (LOM)	AR	356	N41°48'	W71°21'	65
Block Island	BID	216	N41°09'	W71°34'	125
Central	SFZ	241	N41°55'	W71°29'	455
Rench (LOM)	PV	335	N41°38'	W71°29'	—
Westerly	RLS	264	N41°20'	W71°48'	35

South Carolina

Airports

Charleston, SC – Charleston AFB/Intl

Ident	CHS	**ATIS**	124.75
Elev	46	**Rwy/Length/ILS/ID**	03/7000
Lat	N32°54'		21/7000
Long	W80°02'		15/9001/109.70/ICHS
			33/9001/108.90/ICCI

Hilton Head, SC – Hilton Head

Ident	49J	**ATIS**	21
Elev	20	**Rwy/Length/ILS/ID**	03/4300/111.30/IHXD
Lat	N32°13'		21/4300/111.30/IHXD
Long	W80°41'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Allendale	VOR	ALD	116.70	N33°00'	W81°17'	190
Beaufort	VOR	NBC	110.50	N32°28'	W80°43'	49
Charleston	VORTAC	CHS	113.50	N32°53'	W80°02'	40
Chesterfield	VOR-DME	CTF	108.20	N34°39'	W80°16'	610
Colliers	VORTAC	IRQ	113.90	N33°42'	W82°09'	428
Columbia	VORTAC	CAE	114.70	N33°51'	W81°03'	410
Edisto	VOR-DME	EDS	111.40	N33°27'	W80°51'	201
Electric City	VORTAC	ELW	108.60	N34°25'	W82°47'	740
Florence	VORTAC	FLO	115.20	N34°13'	W79°39'	110
Fort Mill	VORTAC	FML	112.40	N34°59'	W80°57'	650
Grand Strand	VORTAC	CRE	117.60	N33°48'	W78°43'	20
Greenwood	VORTAC	GRD	115.50	N34°15'	W82°09'	630
Mc Entire	VORTAC	MMT	113.20	N33°55'	W80°48'	298
Spartanburg	VORTAC	SPA	115.70	N35°02'	W81°55'	910
Vance	VORTAC	VAN	110.40	N33°28'	W80°26'	140

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Aiken	AIK	347	N33°39'	W81°40'	529
Alcot (LOM)	FL	335	N34°10'	W79°51'	140
Anderson Co	AND	230	N34°29'	W82°42'	760
Ashly (LOM/NDB)	CH	329	N32°58'	W80°05'	36
Barnwell	BNL	260	N33°15'	W81°22'	—
Bennettsville	BES	230	N34°37'	W79°43'	146
Benton	BEZ	347	N34°05'	W78°51'	95
Calab (LOM)	CR	267	N33°53'	W78°37'	—
Camden	CDN	263	N34°17'	W80°33'	303
Cheraw	CQW	409	N34°44'	W79°51'	179
Clemson	CEU	257	N34°40'	W82°53'	—
Coronaca	GIW	239	N34°15'	W82°05'	550
Darlington	UDG	245	N34°26'	W79°53'	184
Dillon	DLC	274	N34°27'	W79°22'	122
Dyana (LOM/NDB)	GY	338	N34°41'	W82°26'	—
Enoree	EOE	278	N34°18'	W81°38'	558
Evans	CFY	420	N33°51'	W79°45'	80
Fairmont	FRT	248	N34°54'	W81°59'	—

Location/Name	Ident	Freq	Lat	Long	Elev
Georgetown	GGE	242	N33°18'	W79°19'	—
Greer (LOM)	GS	287	N34°48'	W82°16'	—
Hartsville	HVS	341	N34°24'	W80°06'	—
Horry	HYW	370	N33°49'	W79°07'	55
Johns Island	JZI	283	N32°42'	W80°00'	—
Judky (LOM)	GM	521	N34°46'	W82°20'	—
Kingstree	CKI	404	N33°43'	W79°51'	66
Lake Keowee	LQK	408	N34°48'	W82°42'	970
Lancaster	LKR	400	N34°43'	W80°51'	—
Laurens	LUX	307	N34°30'	W81°56'	695
Manning	MNI	381	N33°35'	W80°12'	—
Marion	MAO	388	N34°11'	W79°19'	113
Mc Entire	MMT	427	N33°56'	W80°47'	298
Moncks Corner	MKS	354	N33°11'	W80°02'	—
Murry (LOM)	CA	362	N33°58'	W81°14'	330
Orangeburg	OYI	226	N33°25'	W80°54'	200
Pageland	PYG	270	N34°44'	W80°20'	569
Rally	UZ	227	N34°53'	W81°04'	523
Siler City	TOX	371	N35°45'	W79°27'	670
Stuckey	HEK	236	N33°43'	W79°31'	—
Sumter	SMS	252	N33°59'	W80°21'	—
Union Co	UOT	326	N34°41'	W81°38'	580
Walterboro	RBW	221	N32°55'	W80°38'	98
Winnsboro	FDW	414	N34°18'	W81°06'	55

South Dakota

Airports

Rapid City, SD – Rapid City Regional

Ident	RAP	**ATIS**	118.70
Elev	3202	**Rwy/Length/ILS/ID**	05/3600
Lat	N44°03'		23/3600
Long	W103°03'		14/8701
			32/8701/109.30/IRAP

Sioux Falls, SD – Joe Foss Field

Ident	FSD	**ATIS**	126.60
Elev	4129	**Rwy/Length/ILS/ID**	03/8999/109.90/IFSD
Lat	N43°34'		21/8999/111.10/IJOU
Long	W96°44'		09/3152
			27/3152
			15/6658
			33/6658

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Aberdeen	VOR-DME	ABR	113.00	N45°25'	W98°22'	1300
Brookings	VOR-DME	BKX	108.80	N44°18'	W96°48'	1640
Buffalo	VOR	BUA	109.40	N45°32'	W103°28'	3020
Dupree	VORTAC	DPR	116.80	N45°04'	W101°42'	2530
Huron	VORTAC	HON	117.60	N44°26'	W98°18'	1300
Lemmon	VOR	LEM	111.40	N45°55'	W102°06'	2572
Mitchell	VOR-DME	MHE	109.20	N43°46'	W98°02'	1300
Mobridge	VOR	MBG	108.60	N45°33'	W100°21'	1925
Philip	VOR-DME	PHP	108.40	N44°03'	W101°39'	2340
Pierre	VORTAC	PIR	112.50	N44°23'	W100°09'	1790
Rapid City	VORTAC	RAP	112.30	N43°58'	W103°00'	3150
Sioux Falls	VORTAC	FSD	115.00	N43°38'	W96°46'	1570
Watertown	VORTAC	ATY	116.60	N44°58'	W97°08'	1750
Winner	VOR	ISD	112.80	N43°29'	W99°45'	2355
Yankton	VOR-DME	YKN	111.40	N42°55'	W97°23'	1300

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Beady (LOM)	HO	302	N44°26'	W98°20'	1313
Belle Fourche	EFC	269	N44°44'	W103°51'	3189
Black Hills	SPF	300	N44°29'	W103°47'	3885
Britton	BTN	386	N45°48'	W97°44'	—
Cagur (LOM)	YK	347	N42°50'	W97°18'	1215
Flying T	FTA	388	N43°23'	W103°26'	3440
Hand	MKA	371	N44°31'	W98°57'	1568
Lican (LOM)	AT	215	N44°48'	W97°09'	—
Ranch (LOM/NDB)	RA	254	N43°57'	W102°59'	2994
Reney (LOM)	AB	203	N45°23'	W98°19'	—
Riverbend	RVB	407	N45°32'	W100°24'	1702
Rokky (LOM/NDB)	FS	245	N43°29'	W96°49'	1526
Vermillion	VMR	375	N42°45'	W96°56'	1143
Wagner	AGZ	392	N43°03'	W98°17'	1462
Wentworth	MDS	400	N44°00'	W97°05'	1714

Tennessee

Airports

Memphis, TN – Memphis Intl

Ident	MEM	**ATIS**	127.75
Elev	332	**Rwy/Length/ILS/ID**	09/8936/109.50/IMEM
Lat	N35°03'		27/8936/108.70/IJIM
Long	W89°58'		18L/8400/108.30/ISDU
			36R/8400/110.50/ITSE
			18R/9319/109.90/IOOI
			36L/9319/108.90/IOHN

Nashville, TN – Nashville Intl

Ident	BNA	**ATIS**	135.67
Elev	599	**Rwy/Length/ILS/ID**	2R/8000/111.75/IUQU
Lat	N36°07'		20L/8000/109.35/ISSX
Long	W86°40'		2C/8000/110.75/IIAX
			20C/8000
			2L/7702/109.90/IBNA
			20R/7702/111.30/IVIY
			13/11029
			31/11029/109.70/IPNO

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Arnold Afs	VOR	AYX	112.50	N35°23'	W86°05'	1070
Choo Choo	VORTAC	GQO	115.80	N34°57'	W85°09'	1030
Clarksville	VOR-DME	CKV	110.60	N36°37'	W87°24'	540
Dyersburg	VORTAC	DYR	116.80	N36°01'	W89°19'	380
Graham	VORTAC	GHM	111.60	N35°50'	W87°27'	770
Hinch Mountain	VORTAC	HCH	117.60	N35°46'	W84°58'	3040
Holston Mountain	VORTAC	HMV	114.60	N36°26'	W82°07'	4321
Jacks Creek	VORTAC	JKS	109.40	N35°35'	W88°21'	630
Lafayette	VORTAC	LFT	109.80	N30°11'	W91°59'	985
Livingston	VORTAC	LVT	108.40	N36°35'	W85°09'	1020
Mc Kellar	VOR-DME	MKL	112.00	N35°36'	W88°54'	410
Memphis	VORTAC	MEM	117.50	N35°03'	W89°58'	250
Nashville	VORTAC	BNA	114.10	N36°08'	W86°41'	620
Shelbyville	VOR-DME	SYI	109.00	N35°33'	W86°26'	810
Snowbird	VORTAC	SOT	108.80	N35°47'	W83°03'	4239
Volunteer	VORTAC	VXV	116.40	N35°54'	W83°53'	1290

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Aulon (LOM/NDB)	ME	287	N35°03'	W90°04'	—
Benfi (LOM)	TY	353	N35°44'	W84°04'	—
Boiling Fork	BGF	263	N35°10'	W86°04'	979
Booie (LOM/NDB)	BO	221	N36°23'	W82°29'	1600
Burwi	ULH	332	N35°27'	W86°14'	810
Covington	COO	326	N35°35'	W89°35'	270
Daisy	CQN	341	N35°09'	W85°09'	—
Dickson	DMZ	203	N36°07'	W87°25'	852
Dobbs (LOM)	BN	304	N36°01'	W86°43'	985
Dulaney	DYQ	263	N36°08'	W82°53'	1550
Elizabethton	EZT	275	N36°18'	W82°16'	1722
Elvis (LOM/NDB)	TS	371	N34°57'	W89°58'	—
Gallatin	GYN	214	N36°22'	W86°24'	560
Gibson	TGC	378	N35°56'	W88°51'	—
Giles	GZS	375	N35°09'	W87°03'	659
Graham	GHX	371	N33°09'	W98°29'	—
Hardeman	BAV	404	N35°12'	W89°02'	500
Hardwick	HDI	369	N35°09'	W84°54'	—
Huntingdon	HZD	217	N36°05'	W88°27'	485
Hurricane	SKN	256	N35°59'	W85°48'	1050
Hutchins	HEM	233	N35°59'	W85°35'	1086
Jacksboro	JAU	204	N36°20'	W84°09'	1170
Jasper	APT	382	N35°03'	W85°35'	—
Jefferson	JXT	346	N36°06'	W83°28'	1218
Kelso	TNY	358	N35°08'	W86°32'	—
Lafayette	LFB	245	N36°30'	W86°03'	985
Lascassas	MBT	317	N35°52'	W86°22'	—
Lawrenceburg	LRT	269	N35°14'	W87°15'	941
Lebanon	LDQ	414	N36°11'	W86°18'	570
Loosahatchie	LHC	265	N35°17'	W89°40'	308
Madisonville	MNV	361	N35°32'	W84°22'	1005
Mark Anton	DTE	394	N35°28'	W84°55'	710
Maury County	PBC	365	N35°36'	W87°05'	730
Mc Minn Co	MMI	242	N35°23'	W84°33'	840
Mersy (LOM)	MK	394	N35°30'	W88°57'	—
Millington	MIG	232	N35°16'	W89°55'	—
Mocca (LOM)	TR	299	N36°33'	W82°19'	—
Mountain City	JJO	396	N36°24'	W81°49'	2247
Nally Dunston	DNT	343	N35°59'	W89°24'	370
Needmore	PED	221	N36°32'	W86°55'	706
Obion	OQZ	212	N36°17'	W88°59'	305
Opery (LOM/NDB)	VI	344	N36°12'	W86°39'	433
Piney Grove	BPO	403	N36°32'	W84°28'	1460
Pinhook	HHY	242	N35°13'	W88°12'	395
Rogersville	RVN	329	N36°27'	W82°53'	1248
Sewanee	UOS	275	N35°12'	W85°53'	—

Location/Name	Ident	Freq	Lat	Long	Elev
Sewart	SWZ	391	N35°57'	W86°27'	—
Sibley	SZY	386	N35°14'	W88°30'	550
Snuff (LOM)	CK	335	N36°31'	W87°23'	501
Spain	SPQ	414	N35°12'	W90°03'	—
Trainer	TIQ	410	N36°14'	W88°24'	450
Verona	LUG	251	N35°30'	W86°48'	—
Warri (LOM/NDB)	RN	209	N35°45'	W85°45'	992
Waverly	AEY	329	N36°06'	W87°44'	708

Texas

Airports

Dallas-Ft Worth, TX – DFW Intl

Ident	DFW	**ATIS**	135.50
Elev	603	**Rwy/Length/ILS/ID**	13L/9300
Lat	N32°54'		31R/9300/110.90/IRRA
Long	W97°00'		13R/9000/109.50/ILWN
			31L/9000
			17L/11388/110.30/IFLQ
			35R/11388/110.30/IPKQ
			17R/13400/111.35/IJHZ
			35L/13400/111.35/IUWX
			18L/11387/110.55/ICIX
			36R/11387/110.55/IFJN
			18R/11388/111.90/IVYN
			36L/11388/111.90/IBXN

Houston, TX – Houston Intercontinental

Ident	IAH	**ATIS**	124.05
Elev	98	**Rwy/Length/ILS/ID**	08/9401/109.70/IIAH
Lat	N29°59'		26/9401/109.70/IJYV
Long	W95°20'		09/9999/110.90/IUYO
			27/9999/110.90/IGHI
			14L/12001/111 90/IHSQ
			32R/12001/111.90/ICDG
			14R/6038
			32L/6038

San Antonio, TX – San Antonio Intl

Ident	SAT	**ATIS**	118.90
Elev	809	**Rwy/Length/ILS/ID**	03/7505/109.70/ISAT
Lat	N29°31'		21/7505
Long	W98°28'		12R/8502/110.90/IANT
			30L/8502/110.90/IIZR
			12L/5519
			30R/5519

Waco, TX – James Connally (TSTC-Waco)

Ident	CNW	**ATIS**	124.00
Elev	590	**Rwy/Length/ILS/ID**	17R/6291
Lat	N31°38'		35L/6291
Long	W97°04'		17L/8600/110.70/ICNW
			35R/8600

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Abilene	VORTAC	ABI	113.70	N32°28'	W99°51'	1810
Acton	VORTAC	AQN	110.60	N32°26'	W97°39'	850
Alice	VOR	ALI	114.50	N27°44'	W98°01'	168
Amarillo	VORTAC	AMA	117.20	N35°17'	W101°38'	3550
Arvilla	TACAN	MJF	109.60	—	—	550
Austin	VORTAC	AUS	117.10	N30°17'	W97°42'	630
Beaumont	VORTAC	BPT	114.50	N29°56'	W94°00'	10
Bergstrom	VOR	BSM	109.80	N30°11'	W97°41'	509
Big Spring	VORTAC	BGS	114.30	N32°23'	W101°29'	2670
Blue Ridge	VORTAC	BUJ	114.90	N33°16'	W96°21'	610
Borger	VORTAC	BGD	108.60	N35°48'	W101°22'	3130
Bridgeport	VORTAC	BPR	116.50	N33°14'	W97°45'	890
Brownsville	VORTAC	BRO	116.30	N25°55'	W97°22'	10
Brownwood	VOR-DME	BWD	108.60	N31°53'	W98°57'	1570
Carswell	VOR	FWH	108.70	N32°46'	W97°26'	663
Center Point	VORTAC	CSI	117.50	N29°55'	W99°12'	2080
Childress	VORTAC	CDS	117.60	N34°22'	W100°17'	1920
College Station	VORTAC	CLL	113.30	N30°36'	W96°25'	370
Corpus Christi	VORTAC	CRP	115.50	N27°54'	W97°26'	54
Cotulla	VORTAC	COT	115.80	N28°27'	W99°07'	520
Cowboy	VOR-DME	CVE	116.20	N32°53'	W96°54'	450
Daisetta	VORTAC	DAS	116.90	N30°11'	W94°38'	74
Dalhart	VORTAC	DHT	112.00	N36°05'	W102°32'	4020
Dallas	VOR	NBE	108.30	N32°44'	W96°58'	463
Dallas-Ft Worth	VORTAC	DFW	117.00	N32°51'	W97°01'	560
Eagle Lake	VOR-DME	ELA	116.40	N29°39'	W96°19'	190
El Paso	VORTAC	ELP	115.20	N31°48'	W106°16'	4020
Ellington	VORTAC	EFD	109.40	N29°36'	W95°09'	30
Fort Stockton	VORTAC	FST	112.80	N30°57'	W102°58'	3160
Frankston	VOR-DME	FZT	111.40	N32°04'	W95°31'	305
Gray	VOR-DME	GRK	111.80	N31°01'	W97°48'	980
Gregg Co	VORTAC	GGG	112.30	N32°25'	W94°45'	320
Guthrie	VORTAC	GTH	114.50	N33°46'	W100°20'	1940
Harlingen	VOR-DME	HRL	108.80	N26°17'	W97°47'	50
Hobby	VOR-DME	HUB	117.60	N29°39'	W95°16'	50
Hondo	VOR	HDO	109.40	N29°21'	W99°10'	933
Hudspeth	VORTAC	HUP	115.00	N31°34'	W105°22'	4390
Humble	VORTAC	IAH	116.60	N29°57'	W95°20'	90
Industry	VORTAC	IDU	110.20	N29°57'	W96°33'	419
Junction	VORTAC	JCT	116.00	N30°35'	W99°49'	2280
Lampasas	VORTAC	LZZ	112.50	N31°11'	W98°08'	1200

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Laredo	VORTAC	LRD	117.40	N27°28'	W99°25'	583
Laughlin	VORTAC	DLF	114.40	N29°21'	W100°46'	1070
Leona	VORTAC	LOA	110.80	N31°07'	W95°58'	350
Llano	VORTAC	LLO	108.20	N30°47'	W98°47'	1200
Lubbock	VORTAC	LBB	109.20	N33°42'	W101°54'	3310
Lufkin	VORTAC	LFK	112.10	N31°09'	W94°43'	290
Marfa	VOR-DME	MRF	115.90	N30°17'	W103°57'	4830
Mc Allen	VOR-DME	MFE	117.20	N26°10'	W98°14'	100
Midland	VORTAC	MAF	114.80	N32°00'	W102°11'	2850
Millsap	VORTAC	MQP	117.70	N32°43'	W97°59'	890
Navasota	VORTAC	TNV	115.90	N30°17'	W96°03'	240
Newman	VORTAC	EWM	112.40	N31°57'	W106°16'	4040
Palacios	VORTAC	PSX	117.30	N28°45'	W96°18'	20
Paris	VOR-DME	PRX	113.60	N33°32'	W95°26'	655
Pecos	VOR-DME	PEQ	111.80	N31°28'	W103°34'	2620
Plainview	VOR-DME	PVW	112.90	N34°05'	W101°47'	3400
Quitman	VORTAC	UIM	114.00	N32°52'	W95°22'	520
Randolph	VOR	RND	112.30	N29°31'	W98°17'	773
Reese	VORTAC	RVO	108.80	N33°35'	W102°02'	3338
Robinson	VOR-DME	RSV	108.40	N39°01'	W87°38'	394
Rocksprings	VORTAC	RSG	111.20	N30°00'	W100°17'	2320
Sabine Pass	VOR-DME	SBI	115.40	N29°41'	W94°02'	10
Salt Flat	VORTAC	SFL	113.00	N31°44'	W105°05'	3730
San Angelo	VORTAC	SJT	115.10	N31°22'	W100°27'	1890
San Antonio	VORTAC	SAT	116.80	N29°38'	W98°27'	1160
Scholes	VORTAC	VUH	113.00	N29°16'	W94°52'	10
Scurry	VORTAC	SCY	112.90	N32°27'	W96°20'	435
Stinson	VOR	SSF	108.40	N29°15'	W98°26'	540
Stonewall	VORTAC	STV	113.10	N30°12'	W98°42'	1530
Sulphur Springs	VOR-DME	SLR	109	N33°11'	W95°32'	480
Temple	VOR-DME	TPL	110.40	N31°12'	W97°25'	710
Texico	VORTAC	TXO	112.20	N34°29'	W102°50'	4060
Three Rivers	VORTAC	THX	111.40	N28°30'	W98°09'	270
Traux	VORTAC	NGP	114.00	N27°41'	W97°17'	10
Trinity	VOR-DME	MHF	113.60	N29°32'	W94°44'	38
Tuscola	VOR-DME	TQA	111.60	N32°14'	W99°49'	2020
Tyler	VOR-DME	TYR	114.20	N32°21'	W95°24'	540
Victoria	VOR-DME	VCT	109.00	N28°54'	W96°58'	130
Waco	VORTAC	ACT	115.30	N31°39'	W97°16'	510
Wichita Falls	VORTAC	SPS	112.70	N33°59'	W98°35'	1100
Wink	VORTAC	INK	112.10	N31°52'	W103°14'	2870

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Alamo (LOM/NDB)	AN	368	N29°36'	W98°34'	—
Alibi (LOM/NDB)	CX	281	N30°25'	W95°28'	370
Amason	CZJ	341	N31°50'	W94°08'	312
Ambassador	ABG	404	N32°35'	W95°06'	—
Anahuac	CBC	413	N29°46'	W94°39'	21
Andrau	AAP	269	N29°44'	W95°35'	80
Andrews	ANR	245	N32°20'	W102°32'	3170
Athens	AHX	269	N32°09'	W95°49'	455
Atlanta	ATA	347	N33°06'	W94°11'	271
Austi (LOM/NDB)	AU	353	N30°14'	W97°37'	—
Ballinger	UBC	239	N31°40'	W99°58'	1735
Bay City	BYY	344	N28°58'	W95°51'	41
Beeville	BEA	284	N28°22'	W97°47'	269
Bluie (LOM)	SA	219	N29°28'	W98°31'	—
Bonham	HJM	415	N33°36'	W96°10'	607
Brady	BBD	380	N31°10'	W99°19'	1816
Brashear	BHG	338	N33°09'	W95°37'	483
Brazos River	GZV	280	N32°57'	W98°24'	1003
Breckenridge	BKD	245	N32°44'	W98°53'	1282
Brenham	BNH	362	N30°13'	W96°22'	274
Brewster Co	BWR	201	N30°27'	W103°38'	4200
Brons (LOM)	AD	407	N33°02'	W96°52'	585
Brooks Co	BKS	353	N27°12'	W98°07'	115
Brownfield	BFE	311	N33°10'	W102°11'	—
Burnet	BMQ	341	N30°44'	W98°14'	—
Caddo Mills	MII	316	N33°02'	W96°14'	541
Carthage	RPF	332	N32°10'	W94°17'	242
Cash	SYW	428	N32°58'	W96°04'	493
Castroville	CVB	338	N29°20'	W98°50'	—
Chaparrosa Ranc	CPZ	385	N28°54'	W100°00'	700
Cherokee Co	JSO	263	N31°52'	W95°12'	670
Clarendon	CNZ	281	N34°54'	W100°52'	2825
Coffi (LOM)	AC	242	N31°41'	W97°12'	—
Coleman	COM	385	N31°50'	W99°24'	88
Conis (LOM)	LV	275	N32°46'	W96°46'	—
Conor (LOM/NDB)	CR	382	N27°50'	W97°34'	68
Corsicana	CRS	396	N32°01'	W96°23'	440
Crosbyton	CZX	332	N33°37'	W101°14'	3012
David Hooks	DWH	521	N30°07'	W95°33'	—
Denison	DNI	341	N33°49'	W96°40'	—
Depoo (LOM)	BR	393	N25°59'	W97°30'	—
Devine	HHH	359	N29°08'	W98°56'	698
Dimmit Co	DMD	343	N28°31'	W99°49'	612
Durrett	DUX	414	N35°51'	W102°00'	3693
Farly (LOM/NDB)	MA	326	N31°59'	W102°19'	—
Fluet (LOM)	EF	421	N33°15'	W96°35'	642
Flufy (LOM)	LF	350	N31°13'	W94°49'	205
Fostr (LOM)	VC	226	N28°54'	W97°00'	138
Freep (LOM)	LB	263	N29°11'	W95°27'	35
Gaines Co	GNC	344	N32°40'	W102°38'	3271
Gainesville	GLE	330	N33°43'	W97°11'	860
Galveston	GLS	206	N29°20'	W94°45'	—
Garys (LOM)	RU	272	N29°57'	W97°56'	790
Georgetown	GUO	332	N30°41'	W97°40'	779
Goodhue	GDE	368	N30°04'	W94°12'	—
Grindstone Mtn	GMZ	356	N33°36'	W97°46'	1097
Hamilton	MNZ	251	N31°37'	W98°08'	1268
Hardin Co	HRD	524	N30°20'	W94°15'	68

Location/Name	Ident	Freq	Lat	Long	Elev
Haskell	AKL	407	N33°11'	W99°43'	1622
Hebbronville	HBV	266	N27°21'	W98°44'	657
Hemphill Co	HHF	400	N35°53'	W100°24'	—
Henderson	HNO	371	N32°11'	W94°51'	461
Hereford	HRX	341	N34°51'	W102°19'	3781
Hondo	HMA	329	N29°22'	W99°10'	933
Hood	HLR	347	N31°07'	W97°42'	—
Hull	SGR	388	N29°37'	W95°39'	98
Humphrey	HPY	275	N29°47'	W94°57'	35
Huntsville	UTS	308	N30°44'	W95°35'	943
Iresh (LOM/NDB)	IL	278	N31°01'	W97°42'	857
Issue (LOM)	PK	233	N32°48'	W97°01'	499
Jackson Co	EDX	201	N29°00'	W96°35'	—
Jasper	JAS	344	N30°57'	W94°02'	641
Jecca	JUG	388	N32°40'	W96°31'	420
Jiffy (LOM)	FL	219	N32°59'	W97°01'	525
Kazoo (LOM)	BP	257	N29°59'	W94°06'	—
Kleberg Co	TKB	347	N27°36'	W98°05'	—
Kotti (LOM)	DR	335	N29°26'	W100°59'	1148
La Fonda Ranch	BRX	269	N29°12'	W100°37'	1018
Lakeside	LYD	249	N29°48'	W95°40'	126
Lamesa	LSA	338	N32°45'	W101°54'	2997
Lancaster	LNC	239	N32°34'	W96°43'	495
Lee Co	GYB	385	N30°10'	W96°58'	464
Leroi (LOM)	CN	283	N31°44'	W97°04'	570
Levelland	LLN	266	N33°33'	W102°22'	3503
Littlefield	LIU	212	N33°55'	W102°23'	3602
Lone Star	LST	305	N32°55'	W94°44'	—
Lubbi (LOM)	LD	272	N33°39'	W101°43'	3197
Major (LOM)	GV	201	N33°09'	W96°03'	515
Marathon	IMP	388	N30°15'	W103°14'	4274
Marbe (LOM)	HS	379	N30°04'	W95°24'	—
Mesquite	PQF	248	N32°48'	W96°31'	445
Mexia	LXY	329	N31°38'	W96°30'	533
Mineral Wells	MWL	266	N32°47'	W98°03'	—
Missi (LOM)	MF	388	N26°15'	W98°18'	—
Monahans	OHE	214	N31°34'	W102°54'	2613
Mount Pleasant	MSA	381	N33°07'	W94°58'	390
Mufin (LOM/NDB)	FT	365	N32°53'	W97°22'	—
Nacogdoches	GXD	391	N31°38'	W94°42'	445
New Braunfels	BAZ	212	N29°42'	W98°02'	—
Nixin (LOM)	JY	326	N29°59'	W95°12'	75
Old Rip	OIP	410	N32°23'	W98°48'	1428
Olney	ONY	272	N33°21'	W98°48'	—
Orange	ORG	211	N30°04'	W93°47'	14
Palestine	PSN	375	N31°46'	W95°42'	—
Pampa	PPA	368	N35°36'	W100°59'	—
Pande (LOM/NDB)	AM	251	N35°08'	W101°48'	3623
Pekks (LOM)	LR	405	N27°38'	W99°27'	675
Perryton	PYX	266	N36°24'	W100°44'	—
Pinck (LOM)	DT	257	N33°16'	W97°11'	—
Pleasanton	PEZ	275	N28°57'	W98°31'	—
Pollo (LOM)	LB	219	N33°44'	W101°49'	—
Port Lavaca	PKV	515	N28°39'	W96°40'	26
Powell	CGQ	344	N32°03'	W96°25'	394
Pyramid	PYF	418	N31°51'	W96°11'	350
Reagan Co	LUJ	341	N31°11'	W101°28'	2698
Redbird	RBD	287	N32°40'	W96°52'	—
Robinson	ROB	400	N31°30'	W97°04'	394
Rockport	RKP	391	N28°05'	W97°02'	25
Rosanky	RYU	266	N29°53'	W97°20'	498
Rowdy (LOM)	CL	260	N30°29'	W96°20'	—
Sandy Point	SYG	338	N29°30'	W95°28'	65
Sanjac	JPA	347	N29°40'	W95°04'	24
Scotland	SKB	344	N33°47'	W98°29'	985
Sebas (LOM/NDB)	HR	338	N26°18'	W97°39'	—
Shawn (LOM/NDB)	SP	296	N33°54'	W98°27'	—
Shein (LOM/NDB)	ER	263	N29°54'	W99°00'	1592
Snyder	SDR	359	N32°42'	W100°56'	2434
Sonora	SOA	371	N30°34'	W100°38'	2139
Spofford	PFO	356	N29°08'	W100°25'	967
Stamford	TMV	290	N32°52'	W99°43'	1541
Starn (LOM/NDB)	GR	323	N31°10'	W97°52'	877
Sweetwater	SWW	275	N32°27'	W100°27'	2360
Tomball	TMZ	408	N30°04'	W95°33'	—
Tomhi (LOM)	AB	353	N32°17'	W99°40'	1950
Travis	AVZ	299	N32°45'	W96°14'	491
Tutte (LOM)	HU	395	N29°35'	W95°20'	—
Tyler (LOM/NDB)	TY	320	N32°24'	W95°28'	—
Uvalde	UVA	281	N29°10'	W99°43'	—
Valtr (LOM/NDB)	EL	242	N31°51'	W106°19'	3940
Van Horn	VHN	233	N31°03'	W104°47'	3955
Veels (LOM)	GG	410	N32°27'	W94°47'	—
Weiser	EYQ	286	N29°56'	W95°38'	138
Wharton	ARM	245	N29°15'	W96°09'	97
Wilbarger	VRT	230	N34°13'	W99°16'	1250
Winters	IEW	396	N31°57'	W99°59'	1862
Woole (LOM)	SJ	356	N31°16'	W100°34'	2140
Yoakum	OKT	350	N29°18'	W97°08'	348

Utah

Airports

Salt Lake City, UT – Salt Lake City Intl

Ident	SLC	**ATIS**	124.75
Elev	4227	**Rwy/Length/ILS/ID**	14/4758
Lat	N40°46'		32/4758
Long	W111°58'		16/12003/110.70/IMOY
			34/12003/109.50/ISLC
			17/9596/111.50/IBNT
			35/9596/110.10/IUTG

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Bonneville	VORTAC	BVL	112.30	N40°43'	W113°45'	4220
Bryce Canyon	VORTAC	BCE	112.80	N37°41'	W112°18'	9040
Carbon	VOR-DME	PUC	115.50	N39°36'	W110°45'	5890
Cedar City	VOR-DME	CDC	108.60	N37°47'	W113°04'	5460
Delta	VORTAC	DTA	116.10	N39°18'	W112°30'	4600
Fairfield	VORTAC	FFU	116.60	N40°16'	W111°56'	7690
Hanksville	VORTAC	HVE	115.90	N38°25'	W110°41'	4430
Logan	VOR-DME	LGU	109.80	N41°50'	W111°51'	4450
Lucin	VORTAC	LCU	113.60	N41°21'	W113°50'	4400
Milford	VORTAC	MLF	112.10	N38°21'	W113°00'	4980
Moab	VOR-DME	OAB	109.80	N38°45'	W109°44'	4570
Myton	VORTAC	MTU	112.70	N40°08'	W110°07'	5332
Ogden	VORTAC	OGD	115.70	N41°13'	W112°05'	4220
Provo	VOR-DME	PVU	108.40	N40°12'	W111°43'	4490
Saint George	VOR-DME	OZN	109.80	N37°05'	W113°35'	2898
Salt Lake City	VORTAC	SLC	116.80	N40°51'	W111°58'	4220
Vernal	VOR-DME	VEL	108.20	N40°22'	W109°29'	5340

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Blanding	BDG	340	N37°31'	W109°29'	—
Brigham City	BMC	294	N41°30'	W112°04'	—
Dugway	DPG	284	N40°10'	W112°56'	—
Kernn (LOM)	SL	338	N40°40'	W111°57'	4310
Meggi (LOM)	EC	217	N37°47'	W113°01'	—
Tooele	TVY	371	N40°36'	W112°20'	4293

Vermont

Airports

Burlington, VT – Burlington Intl

Ident	BTV	**ATIS**	123.80
Elev	334	**Rwy/Length/ILS/ID**	01/3602
Lat	N44°28'		19/3602
Long	W73°09'		15/7807/110.30/IBTV
			33/7807

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Burlington	VORTAC	BTV	117.50	N44°23'	W73°10'	420
Montpelier	VOR-DME	MPV	110.80	N44°05'	W72°26'	2080

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Dyer	DYO	239	N43°35'	W72°57'	630
Herro (LOM)	BT	219	N44°31'	W73°14'	293
Ira	IRA	398	N43°41'	W72°59'	—
Lyndonville	LLX	353	N44°30'	W72°01'	1058
Morrisville-Stowe	JRV	375	N44°34'	W72°35'	830
Mount Mansfield	VKN	268	N44°23'	W72°41'	—
Mount Snow	VWD	224	N42°55'	W72°51'	1290
Newport	EFK	242	N44°57'	W72°10'	—
Springfield	SXD	265	N43°16'	W72°35'	—
Williams	MWX	257	N44°07'	W72°31'	—

Virginia

Airports

Norfolk, VA – Norfolk Intl

Ident	ORF	**ATIS**	127.15
Elev	27	**Rwy/Length/ILS/ID**	05/9000/109.10/IORF
Lat	N36°53'		23/9000/109.10/IJZQ
Long	W76°11'		14/4876
			32/4876

Richmond, VA – Richmond Intl-Byrd Field

Ident	RIC	**ATIS**	119.15
Elev	168	**Rwy/Length/ILS/ID**	02/6607/110.90/IEZD
Lat	N37°30'		20/6607
Long	W77°19'		07/5316
			25/5316
			16/9003/110.70/IRGJ
			34/9003/110.70/IBNE

Washington, VA – Washington Dulles Intl.

Ident	3VA5	**ATIS**	134.85
Elev	313	**Rwy/ILS/ID**	01R/110.1/IIAD
Lat	N38°56'		01L/111.3/IOSZ
Long	W77°27'		19R/111.3/IDLX
			19L/110.1/ISGC
			12/109.3/IAJU

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Armel	VORTAC	AML	113.50	N38°56'	W77°28'	297
Brooke	VORTAC	BRV	114.50	N38°20'	W77°21'	120
Cape Charles	VORTAC	CCV	112.20	N37°20'	W75°59'	10
Casanova	VORTAC	CSN	116.30	N38°38'	W77°51'	450
Chambers	VOR	NGU	111.10	N36°56'	W76°16'	45
Danville	VOR	DAN	113.10	N36°34'	W79°20'	570
Flat Rock	VORTAC	FAK	113.30	N37°31'	W77°49'	460
Franklin	VORTAC	FKN	110.60	N36°42'	W77°00'	90
Glade Spring	VOR-DME	GZG	110.20	N36°49'	W82°04'	4200
Gordonsville	VORTAC	GVE	115.60	N38°00'	W78°09'	380
Harcum	VORTAC	HCM	108.80	N37°26'	W76°42'	10
Hopewell	VORTAC	HPW	112.00	N37°19'	W77°06'	70
Lawrenceville	VORTAC	LVL	112.90	N36°49'	W77°54'	350
Linden	VORTAC	LDN	114.30	N38°51'	W78°12'	2440
Lynchburg	VORTAC	LYH	109.20	N37°15'	W79°14'	880
Montebello	VOR-DME	MOL	115.30	N37°54'	W79°06'	3460
Norfolk	VORTAC	ORF	116.90	N36°53'	W76°12'	20
Pulaski	VORTAC	PSK	116.80	N37°05'	W80°42'	2120
Richmond	VORTAC	RIC	114.10	N37°30'	W77°19'	160
Roanoke	VORTAC	ROA	109.40	N37°20	W80°04'	3060
South Boston	VORTAC	SBV	110.40	N36°40'	W79°00'	530
Washington	VOR-DME	DCA	111.00	N38°51'	W77°02'	10
Woodrum	VOR	ODR	114.90	N37°19'	W79°58'	1160

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Ashey	LJK	280	N37°46'	W77°28'	220
Azalea Park	AZS	336	N38°00'	W78°31'	378
Bales (LOM/NDB)	UV	396	N36°35'	W79°55'	1080
Blackstone	BKT	326	N37°07'	W78°02'	419
Bojar (LOM/NDB)	LY	385	N37°15'	W79°14'	—
Bridgewater	VBW	241	N38°21'	W78°57'	—
Callahan	CNQ	379	N37°15'	W80°09'	1245
Caverns	LUA	245	N38°41'	W78°28'	—
Chase City	CXE	342	N36°47'	W78°30'	520
Cogan	TZ	364	N39°05'	W78°04'	550
Culpeper	CJR	252	N38°31'	W77°51'	310
Davee (LOM)	DA	223	N38°39'	W77°06'	54
Emporia	EMV	346	N36°40'	W77°28'	—
Farmville	FVX	367	N37°21'	W78°26'	412
Felker	FAF	226	N37°08'	W76°37'	—
Fort A P Hill	APH	396	N38°05'	W77°19'	284
Georgetown	GTN	323	N38°55'	W77°07'	—
Goodwin Lake	GDX	227	N38°57'	W77°49'	505
Henry	PJS	375	N37°07'	W76°29'	39
Hillsville	HLX	269	N36°45'	W80°49'	2737
Ingle (LOM)	OR	329	N36°50'	W76°15'	5
Long Hollow	LQV	252	N36°42'	W83°04'	1670
Louisa	IQK	382	N38°01'	W77°51'	475
Mecklenburg	MBV	356	N36°41'	W78°03'	430
Melfa	MFV	388	N37°39'	W75°45'	48
Orange	COG	428	N38°13'	W78°08'	760
Oxonn (LOM/NDB)	DC	332	N38°45'	W77°01'	—
Petersburg	PTB	284	N37°07'	W77°34'	—
Portsmouth	PVG	241	N36°46'	W76°26'	23
Pubbs (LOM/NDB)	CF	392	N37°19'	W77°27'	180
Shannon	EZF	237	N38°15'	W77°26'	123
Staut (LOM)	SH	375	N38°12'	W78°57'	—
Suffolk	SFQ	203	N36°40'	W76°36'	—
Suzze (LOM/NDB)	MK	335	N36°55'	W81°14'	—
Tech	TEC	257	N37°12'	W80°24'	—
Tille (LOM)	IA	346	N38°50'	W77°26'	242
Vinton	VIT	277	N37°12'	W79°52'	913
Wakefield	AKQ	274	N36°58'	W77°00'	115
Whine (LOM)	VJ	236	N36°44'	W81°56'	—

Washington

Airports

Alderwood Manor, WA – Martha Lake

Ident	S13	**ATIS**	—
Elev	500	**Rwy/Length**	16/3000
Lat	N47°51'		34/3000
Long	W122°14'		

Arlington, WA – Arlington Muni

Ident	AWO	**ATIS**	—
Elev	137	**Rwy/Length/ILS/ID**	11/3500
Lat	N48°09'		29/3500
Long	W122°09'		16/5333
			34/5333/111.5/IAWO

Auburn, WA – Auburn Muni

Ident	S50	**ATIS**	—
Elev	57	**Rwy/Length**	16/3400
Lat	N47°19'		34/3400
Long	W122°13'		

Bremerton, WA – Bremerton National

Ident	PWT	**ATIS**	—
Elev	439	**Rwy/Length/ILS/ID**	01/6200
Lat	N47°29'		19/6200/111.1/IPWT
Long	W122°45'		

Chelan, WA – Chelan Muni

Ident	S10	**ATIS**	—
Elev	1263	**Rwy/Length**	—
Lat	N47°51		
Long	W119°56'		

Everett, WA – Everett/Snohomish/Paine Field

Ident	PAE	**ATIS**	128.65
Elev	606	**Rwy/Length/ILS/ID**	11/4514
Lat	N47°54'		29/4514
Long	W122°16'		16R/9010/109.30/IPAE
			34L/9010
			16L/3000
			34R/3000

Monroe, WA – First Air Field

Ident	WA38	**ATIS**	—
Elev	50	**Rwy/Length**	07/2092
Lat	N47°52'		25/2092
Long	W121°59'		

Olympia, WA – Olympia

Ident	OLM	**ATIS**	124.40
Elev	206	**Rwy/Length/ILS/ID**	08/5001
Lat	N46°58'		26/5001
Long	W122°54'		17/5419/111.9/IOLM
			35/5419

Port Angeles, WA – Wm R Fairchild Intl

Ident	CLM	**ATIS**	134.15
Elev	288	**Rwy/Length/ILS/ID**	08/6349/108.9/ICLM
Lat	N48°07'		26/6349
Long	W123°29'		13/3245
			31/3245

Port Orchard, WA – Port Orchard

Ident	OS8	**ATIS**	—
Elev	370	**Rwy/Length**	18/2460
Lat	N47°25'		36/2460
Long	W122°39'		

Puyallup, WA – Pierce County-Thun Field

Ident	1S0	**ATIS**	—
Elev	534	**Rwy/Length**	16/3650
Lat	N47°06'		34/3650
Long	W122°17'		

Renton, WA – Renton Muni

Ident	RNT	**ATIS**	—
Elev	29	**Rwy/Length**	15/5379
Lat	N47°29'		33/5379
Long	W122°12'		

Seattle, WA – Boeing Field/King County Intl

Ident	BFI	**ATIS**	127.75
Elev	18	**Rwy/Length/ILS/ID**	13R/10001/110.90/IBFI
Lat	N47°32'		31L/10001
Long	W122°18'		13L/3710
			31R/3710

Seattle, WA – Seattle-Tacoma Intl

Ident	SEA	**ATIS**	118.00
Elev	429	**Rwy/Length/ILS/ID**	16R/9425/111.70/ISZI
Lat	N47°26'		34L/9425/111.70/ITUC
Long	W122°18'		16L/11900
			34R/11900/110.30/ISEA

Shelton, WA – Sanderson

Ident	SHN	**ATIS**	—
Elev	269	**Rwy/Length**	—
Lat	N47°14'		
Long	W123°08'		

Snohomish, WA – Harvey Field

Ident	S43	**ATIS**	—
Elev	16	**Rwy/Length**	13/2660
Lat	N47°54'		31/2660
Long	W122°06'		

Spanaway, WA – Shady Acres

Ident	WA16	**ATIS**	—
Elev	445	**Rwy/Length**	16/1800
Lat	N47°04'		34/1800
Long	W122°22'		

Spanaway, WA – Spanaway

Ident	S44	**ATIS**	—
Elev	373	**Rwy/Length**	16/2700
Lat	N47°05'		34/2700
Long	W122°25'		

Spokane, WA – Felts Field

Ident	SFF	**ATIS**	—
Elev	1953	**Rwy/Length**	3L/4500
Lat	N47°40'		21R/4500
Long	W117°19'		3R/3059
			21L/3059

Tacoma, WA – Tacoma Narrows

Ident	TIW	**ATIS**	124.05
Elev	292	**Rwy/Length/ILS/ID**	17/5002/109.1/ITIW
Lat	N47°16'		35/5002
Long	W122°34'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Battle Ground	VORTAC	BTG	116.60	N45°44'	W122°35'	250
Bellingham	VORTAC	BLI	113.00	N48°56'	W122°34'	80
Ellensburg	VORTAC	ELN	117.90	N47°01'	W120°27'	1770
Ephrata	VORTAC	EPH	112.60	N47°22'	W119°25'	1250
Hoquiam	VORTAC	HQM	117.70	N46°56'	W124°08'	10
McChord	VORTAC	TCM	109.60	N47°08'	W122°28'	280
Moses Lake	VOR-DME	MWH	115.00	N47°12'	W119°19'	1177
Olympia	VORTAC	OLM	113.40	N46°58'	W122°54'	200
Paine	VOR-DME	PAE	110.60	N47°55'	W122°16'	674
Pasco	VOR-DME	PSC	108.40	N46°15'	W119°06'	400
Pullman	VOR-DME	PUW	109.00	N46°40'	W117°13'	2720
Seattle	VORTAC	SEA	116.80	N47°26'	W122°18'	350
Spokane	VORTAC	GEG	115.50	N47°33'	W117°37'	2760
Tatoosh	VORTAC	TOU	112.20	N48°17'	W124°37'	1652
Walla Walla	VOR-DME	ALW	116.40	N46°05'	W118°17'	1150
Wenatchee	VOR-DME	EAT	111.00	N47°23'	W120°12'	1220
Yakima	VORTAC	YKM	116.00	N46°34'	W120°26'	980

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Abern (LOM)	HQ	414	N46°59'	W123°47'	366
Benza (LOM)	BL	338	N48°53'	W122°32'	44
Carney	CAN	274	N47°24'	W122°50'	—
Deerpark	DPY	216	N47°58'	W117°25'	2250
Dondo	ODD	224	N47°21'	W122°18'	320
Donny (LOM)	YK	371	N46°31'	W120°22'	—
Dunez (LOM)	PS	331	N46°20'	W119°00'	651
Elwha (LOM/NDB)	CL	515	N48°09'	W123°40'	1069
Felts	SFF	365	N47°41'	W117°18'	1950
Friday Harbor	FHR	284	N48°31'	W123°01'	180
Graye (LOM/NDB)	GR	216	N47°09'	W122°36'	343
Ione	ION	379	N48°42'	W117°24'	2107
Kelso	LSO	256	N46°09'	W122°54'	—
Kitsap	PWT	206	N47°29'	W122°45'	492
Lacomas	LAC	328	N47°00'	W122°33'	—
Lopez Island	OPZ	356	N48°28'	W122°55'	198
Mason Co	MNC	348	N47°14'	W123°05'	210
Neah Bay	EBY	391	N48°21'	W124°33'	—
Nolla (LOM)	BF	362	N47°37'	W122°23'	142
Omak	OMK	396	N48°27'	W119°31'	1303
Parkk (LOM)	SZ	281	N47°31'	W122°18'	17
Pelly (LOM/NDB)	MW	408	N47°06'	W119°16'	1186
Phort (LOM)	GE	388	N47°40'	W117°27'	—
Renton	RNT	353	N47°29'	W122°12'	20
Riboo (LOM)	RLL	260	N46°22'	W119°15'	395
Ritts (LOM)	PA	396	N48°03'	W122°17'	10
Skagit/Bay View	BVS	240	N48°28'	W122°25'	93
Toledo	TDO	219	N46°28'	W122°49'	371
Trina (LOM)	AL	353	N46°10'	W118°11'	—
Waton (LOM)	AW	382	N48°04'	W122°09'	61

West Virginia

Airports

Huntington, WV – Tri-State/Walker

Ident	HTS	**ATIS**	125.20
Elev	828	**Rwy/Length/ILS/ID**	03/3007
Lat	N38°21'		21/3007
Long	W82°33'		12/6509/109.90/IHTS
			30/6509/108.70/ITUU

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Beckley	VORTAC	BKW	117.70	N37°46'	W81°07'	2500
Bluefield	VORTAC	BLF	110.00	N37°18'	W81°11'	2900
Charleston	VORTAC	HVQ	117.40	N38°20'	W81°46'	1100
Clarksburg	VOR-DME	CKB	112.60	N39°15'	W80°16'	1430
Elkins	VORTAC	EKN	114.20	N38°54'	W80°05'	2160
Henderson	VORTAC	HNN	115.90	N38°45'	W82°01'	860

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Kessel	VOR-DME	ESL	110.80	N39°13'	W78°59'	2590
Martinsburg	VORTAC	MRB	112.10	N39°23'	W77°50'	600
Morgantown	VORTAC	MGW	111.60	N39°33'	W79°51'	2340
Parkersburg	VORTAC	JPU	108.60	N39°26'	W81°22'	1030
Rainelle	VOR	RNL	116.60	N37°58'	W80°48'	3350
Wheeling	VORTAC	HLG	112.20	N40°15'	W80°34'	1270
Wht Sulphur Sprng	VOR	SSU	108.4	N37°45'	W80°18'	3330

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Bushi (LOM/NDB)	LW	346	N37°46'	W80°28'	2160
Dorch (LOM)	HL	212	N40°06'	W80°41'	1270
Guyandot	GTC	293	N37°46'	W81°54'	2121
Huntt (LOM)	HTN	226	N38°23'	W82°39'	758
Nicholas	IJZ	272	N38°10'	W80°55'	1880
Randolph Co	RQY	284	N38°53'	W79°51'	—
Versi (LOM)	PK	388	N39°15'	W81°29'	797

Wisconsin

Airports

Milwaukee, WI – Gen Mitchell International

Ident	MKE	**ATIS**	126.40
Elev	723	**Rwy/Length/ILS/ID**	1R/4182
Lat	N42°56'		19L/4182
Long	W87°53'		1L/9690/110.30/IMKE
			19R/9690/110.30/IBLY
			7R/8011/111.50/IGMF
			25L/8011/111.50/IPXY
			7L/3163
			25R/3163
			13/5868
			31/5868

Oshkosh, WI – Wittman Regional

Ident	OSH	**ATIS**	125.80
Elev	808	**Rwy/Length/ILS/ID**	04/3424
Lat	N43°59'		22/3424
Long	W88°33'		09/6166
			27/6166
			13/3008
			31/3008
			18/8001
			36/8001/110.50/IOSH

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Ashland	VOR-DME	ASX	110.20	N46°32'	W90°55'	820
Badger	VORTAC	BAE	116.40	N43°07'	W88°17'	1080
Burbun	VOR	BUU	114.50	N42°41'	W88°18'	770
Dells	VORTAC	DLL	117.00	N43°33'	W89°45'	1020
Eau Claire	VORTAC	EAU	112.90	N44°53'	W91°28'	900
Falls	VOR	FAH	110.00	N43°46'	W87°50'	—
Green Bay	VORTAC	GRB	115.50	N44°33'	W88°11'	760
Hayward	VOR-DME	HYR	113.40	N46°01'	W91°26'	1207
Horlick	VOR	HRK	117.70	N42°45'	W87°48'	669
Janesville	VORTAC	JVL	114.30	N42°33'	W89°06'	900
Kenosha	VOR	ENW	109.20	N42°35'	W87°55'	730
La Crosse	VOR-DME	LSE	108.40	N43°52'	W91°15'	650
Lone Rock	VORTAC	LNR	112.80	N43°17'	W90°07'	—
Madison	VORTAC	MSN	108.60	N43°08'	W89°20'	860
Manitowoc	VOR-DME	MTW	111.00	N44°07'	W87°40'	650
Oshkosh	VORTAC	OSH	111.80	N43°59'	W88°33'	780
Rhinelander	VORTAC	RHI	109.20	N45°38'	W89°27'	1590
Rice Lake	VOR-DME	IKE	110.00	N45°28'	W91°43'	1130
Siren	VOR-DME	RZN	109.40	N45°49'	W92°22'	987
Stevens Point	VORTAC	STE	110.60	N44°32'	W89°31'	1110
Timmerman	VOR-DME	LJT	112.50	N43°06'	W88°02'	750
Wausau	VORTAC	AUW	111.60	N44°50'	W89°35'	1202
West Bend	VOR	BJB	109.80	N43°25'	W88°07'	870

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Ameron	AHH	278	N45°16'	W92°22'	—
Antigo	AIG	347	N45°09'	W89°06'	1518
Arbor Vitae	ARV	221	N45°55'	W89°43'	1627
Big Doctor	BXR	203	N45°49'	W92°21'	998
Black River Fal	BCK	362	N44°15'	W90°50'	835
Bong	SUW	260	N46°41'	W92°06'	675
Calin (LOM)	DU	266	N44°34'	W90°09'	1170
Cappy (LOM)	MK	410	N42°50'	W87°54'	678
Central Wiscons	HWS	377	N44°46'	W89°40'	1264
Clintonville	CLI	209	N44°37'	W88°43'	865
Codee (LOM)	EN	389	N42°33'	W88°01'	—
Cumberland	UBE	375	N45°30'	W91°58'	1239
Danci (LOM)	CW	275	N44°45	W89°47'	1235
Depre (LOM/NDB)	SG	332	N44°23'	W88°07'	637
Eagle River	EGV	341	N45°55'	W89°15'	1644
Famis (LOM)	GR	356	N44°26'	W88°14'	—
Fichy (LOM)	II	224	N44°45'	W87°26'	700
Fond Du Lac	FLD	248	N43°46'	W88°29'	—
Gamie (LOM)	AT	230	N44°09'	W88°35'	—
Hartford	HXF	200	N43°20'	W88°23'	1032
Janesville	JVL	375	N42°36'	W89°02'	900

Location/Name	Ident	Freq	Lat	Long	Elev
Juneau	UNU	344	N43°25'	W88°42'	968
Kennedy	ENY	254	N46°33'	W90°54'	826
Kettle Moraine	LLE	329	N43°25'	W88°07'	—
Kickapoo	HBW	251	N43°39'	W90°19'	—
Kooky	AKT	407	N44°12'	W88°23'	753
Lake Lawn	LVV	404	N42°42'	W88°35'	—
Land O Lakes	LNL	396	N46°09'	W89°12'	1706
Maggs (LOM)	EA	239	N44°56'	W91°22'	—
Manitowish	MHA	364	N46°07'	W89°52'	1610
Marshfield	MFI	391	N44°38'	W90°11'	1261
Medford	MDZ	335	N45°06'	W90°18'	1461
Merrill	RRL	257	N45°11'	W89°42'	1316
Mindi (LOM)	LS	272	N44°00'	W91°15'	—
Mineral Point	MRJ	365	N42°53'	W90°13'	1157
Monah (LOM/NDB)	MS	400	N43°03'	W89°20'	—
Necedah	DAF	233	N44°02'	W90°04'	914
Neillsville	VIQ	368	N44°33'	W90°30'	1204
Nepco (LOM)	EK	326	N44°15'	W89°53'	925
New Richmond	RNH	257	N45°08'	W92°32'	995
Oconto	OCQ	388	N44°52'	W87°54'	603
Osceola	OEO	233	N45°18'	W92°41'	896
Paser (LOM/NDB)	RA	206	N42°40'	W87°53'	710
Phillips	PBH	263	N45°42'	W90°24'	1463
Platteville	PVB	203	N42°41'	W90°26'	—
Pober (LOM)	OS	395	N43°52'	W88°33'	—
Rice Lake	RIE	407	N45°28'	W91°43'	1130
Rock River	RYV	371	N43°10'	W88°43'	822
Rusk Co	RCX	356	N45°30'	W91°00'	1241
Seeley	SLY	344	N46°06'	W91°23'	1200
Shebb (LOM)	HE	338	N43°50'	W87°46'	693
Shell Lake	SSQ	212	N45°43'	W91°55'	1232
Solon Springs	OLG	388	N46°19'	W91°48'	1099
Sturgeon Bay	SUE	414	N44°50'	W87°25'	771
Teels (LOM/NDB)	GM	242	N42°54'	W88°02'	—
Waukesha	UES	359	N43°02'	W88°14'	905
Waupaca	PCZ	382	N44°19'	W89°00'	804
Wausau	FZK	243	N44°55'	W89°37'	1202
Wisconsin Rapids	ISW	215	N44°21'	W89°50'	1069
Yanks (LOM/NDB)	BL	260	N43°03'	W87°52'	—

Wyoming

Airports

Cheyenne, WY – Cheyenne

Ident	CYS	**ATIS**	134.42
Elev	6156	**Rwy/Length/ILS/ID**	08/9200/110.10/ICYS
Lat	N41°09'		26/9200
Long	W104°48'		12/6691
			30/6691

Jackson, WY – Jackson Hole

Ident	JAC	**ATIS**	122.80
Elev	6445	**Rwy/Length/ILS/ID**	18/6299/109.10/IJAC
Lat	N43°36'		36/6299
Long	W110°44'		

VORs

Location/Name	Type	Ident	Freq	Lat	Long	Elev
Big Piney	VOR-DME	BPI	116.50	N42°34'	W110°06'	6949
Boysen Reservoir	VORTAC	BOY	117.80	N43°27'	W108°17'	7550
Cherokee	VORTAC	CKW	115.00	N41°45'	W107°34'	7050
Cheyenne	VORTAC	CYS	113.10	N41°12'	W104°46'	6210
Cody	VOR-DME	COD	111.80	N44°37'	W108°57'	4790
Crazy Woman	VORTAC	CZI	117.30	N43°59'	W106°26'	4800
Douglas	VOR-DME	DGW	108.60	N42°40'	W105°13'	4900
Dunoir	VOR-DME	DNW	113.40	N43°49'	W110°20'	7720
Evanston	VOR-DME	EVW	110.00	N41°16'	W111°01'	7187
Fort Bridger	VORTAC	FBR	108.60	N41°22'	W110°25'	7060
Gillette	VOR-DME	GCC	114.60	N44°20'	W105°32'	4335
Jackson	VOR-DME	JAC	108.40	N43°36'	W110°44'	6430
Laramie	VORTAC	LAR	117.60	N41°20'	W105°43'	7280
Medicine Bow	VORTAC	MBW	111.60	N41°50'	W106°00'	7000
Muddy Mountain	VORTAC	DDY	116.20	N43°05'	W106°16'	5860
Newcastle	VOR	ECS	108.20	N43°52'	W104°18''	4210
Rawlins	VOR-DME	RWL	109.40	N41°48'	W107°12'	6750
Riverton	VOR-DME	RIW	108.80	N43°03'	W108°27'	5540
Rock Springs	VORTAC	OCS	116.00	N41°35'	W109°00'	6780
Sheridan	VORTAC	SHR	115.30	N44°50'	W107°03'	4410
Worland	VOR-DME	RLY	114.80	N43°57'	W107°57'	4190

NDBs

Location/Name	Ident	Freq	Lat	Long	Elev
Antelope	AOP	290	N41°36'	W109°00'	—
Cowley	HCY	257	N44°54'	W108°26'	4082
Deryk (LOM/NDB)	GC	380	N44°16'	W105°31'	—
Greybull	GEY	275	N44°30'	W108°04'	3917
Horse (LOM)	CY	353	N41°08'	W104°40'	—
Johno (LOM)	CP	375	N42°54'	W106°34'	—
Kemmerer	EMM	407	N41°49'	W110°33'	—
Klint (LOM)	RI	217	N43°00'	W108°18'	5045
Powell	POY	344	N44°52'	W108°47'	5070
Sinclair	SIR	368	N41°48'	W107°05'	—
Torrington	TOR	293	N42°03'	W104°09'	—
Wenz	PNA	392	N42°47'	W109°48'	7073

Glossary

Ailerons The moveable surfaces on the trailing outer edges of the wings. They control the bank of the aircraft.

Airfoil Any surface or structure on the aircraft that is specifically designed to garner a reaction from air moving over its surface.

Airspeed indicator This indicator displays the aircraft's current speed through the air.

Altimeter This indicator displays the aircraft's current altitude. This is usually calibrated to show the altitude over sea level, or mean sea level (MSL) altitude.

Angle of attack The angle between the relative wind and the wing's chord line. *See also* **Chord**.

Approach lighting system The approach lighting system is designed to aid the pilot with visual references when landing. These lights are usually color coded and flashing in sequence for easy recognition.

Artificial horizon This instrument shows the bank and pitch attitudes of the aircraft with respect to the ground. *See also* **Attitude indicator**.

Aspect ratio The ratio between the chord of the wings and the wingspan.

Atmospheric pressure The pressure exerted by the atmosphere on the earth. At higher elevations, where the air is thinner, the atmospheric pressure is lower.

Attitude This term describes the aircraft's pitch and bank position with regard to the horizon or ground.

Attitude indicator This instrument displays the aircraft's pitch and bank position with regard to the horizon or ground. *See also* **Artificial horizon**.

Auto-coordination When auto-coordination is on, the rudders and ailerons automatically move together to provide turns with no "slips."

Automatic direction finder (ADF) This is a navigational instrument used with nondirectional radio beacons to determine relative headings.

Automatic terminal information service (ATIS) This is a continuously played recording that gives weather and other important information for airfields. It is broadcast by airports on a set frequency and is continually updated.

Autopilot This will fly the aircraft at a set altitude and heading so that the pilot can spend more time on other activities.

Axis indicator This instrument indicates the current axis of the aircraft, which is the direction or aim of the center of the aircraft.

Balloon Ballooning occurs when you increase the angle of attack and pitch attitude too quickly. This can cause a stall.

Bank Rotation around the horizontal axis of the plane; it's also called roll. Tilt your head from side to side to get an idea of bank.

Canopy relative work (CRW) The art of maneuvering your canopies side-by-side or in formation.

Ceiling The altitude of the lowest solid cloud layer. This does not apply to broken or scattered clouds.

Centrifugal force Outward force exerted on an object spun from a central
location.

Chord The distance between the leading and trailing edges of the wing.

Collective Controls the pitch of a helicopter's rotor's blades and is used to climb or descend.

COM An abbreviation for "communication."

Course deviation indicator (CDI) This is a vertical indicator on the omnibearing indicator (OBI) that displays your deviation from the very-high-frequency omnidirectional range (VOR) radial set. If the indicator is to the left of center, the radial is to the left, and likewise.

Course selector This number on the OBI indicates which VOR radial is being tracked.

Crab angle The difference between the aircraft's ground track and its heading, or when the aircraft's nose is at an angle to its direction of travel. Crab angles are necessary whenever a wind is not blowing directly at or behind an airplane.

Cruise speed The average speed calculated during normal level flight.

Cyclic Controls a helicopter's pitch and bank angle, similar to the flight yoke in an airplane.

Dead reckoning Navigation of the aircraft by calculations of airspeed, heading, course, wind and ground speed, and time.

Decision altitude The moment or altitude during a landing approach when a pilot must make the decision whether to land the plane or abort and retry.

Distance measuring equipment (DME) Measures distance in nautical miles from VOR stations.

Drag The retarding force exhibited on the aircraft as it moves through the air.

Electronic flight instrument system (EFIS) Used with CFPD (command flight path display), this displays a proper glide slope for landing.

Elevator Pulling back or pushing forward on the yoke controls the elevator, which controls the pitch of the aircraft.

Federal Aviation Administration (FAA) This agency is the U.S. government body responsible for establishing rules and regulations governing the safe passage of aircraft.

Flaps Flaps increase lift by changing the wing surface. This also has the effect of slowing your stall speed, so you can make a landing approach at a lower airspeed.

Flare A maneuver that slows your descent rate just before touchdown. This is accomplished by pulling back on the yoke.

G Force The force induced on the aircraft as various maneuvers are performed.

Glide slope The path an aircraft takes as it approaches the runway. A proper glide slope minimizes the vertical descent rate and ensures that the plane doesn't overshoot or undershoot the runway.

Ground speed An aircraft's airspeed relative to the ground. Headwinds or tailwinds affect the ground speed of the aircraft.

Heading indicator This indicator displays what direction the plane is facing with respect to the earth's magnetic field.

Horizontal situation indicator (HSI) An instrument on the 737-400 and JetRanger III that provides a top-down view of your location relative to a radio beacon.

Indicated airspeed The airspeed of your airplane, without compensating for air density at altitude. *See also* **True airspeed**.

Instrument flight rules (IFR) A method of navigation that uses an aircraft's instruments to navigate, such as the VOR indicator and the automatic direction finder. *See also* **VFR**.

Instrument landing system (ILS) This system coordinates signals from marker beacons, the localizer, and the glide slope to project the proper orientation and descent rate for a landing. The plane's deviation from the proper glide slope is reflected on the needle.

Instrument rating This rating is awarded to pilots who have completed IFR training and have passed the FAA written exam.

Knots Nautical miles per hour. One nautical mile is equivalent to 1.15 statute miles.

Landing gear Wheels that are raised after takeoff and lowered before landing.

Lift The upward force on an airplane wing created by the curved surface of the wing and the deflection of air downward.

Localizer A radio beam oriented along the runway heading that helps a pilot stay on course during an ILS approach.

Mach number The ratio of your current true airspeed with the current speed of sound.

Magnetic compass This is the only direction-seeking instrument in the plane, and it serves primarily to set the heading indicator and verify its accuracy.

Magnetic heading The orientation of the plane with respect to the earth's magnetic field. The heading is expressed in degrees.

Magneto A device that makes the engine run by providing an electrical current to the spark plug.

Minimum controllable airspeed (MCA) Just above the stall speed, MCA is the lowest speed at which an airplane can fly and still be controllable. MCA varies for different types of aircraft.

Manifold pressure gauge This indicates the power output of the engine by measuring the air pressure in the engine induction system.

Marker beacons Outer, middle, and inner marker beacons are set up at specific distances from the airport and sound a tone in the cockpit when the aircraft crosses over them.

Mixture control This adjusts the air/fuel mixture, allowing you to operate the engine more efficiently.

Navigational radio (NAV) This radio works with the OBI to display your position relative to a ground-based station. Each plane usually has two, labeled NAV 1 and NAV 2.

Nondirectional radio beacon (NDB) This is a ground-based station that broadcasts a signal that can be picked up by your automatic direction finder (ADF).

Omnibearing indicator (OBI) An instrument that works in conjunction with your NAV 1 radio to display your current position relative to a VOR station.

Performance boosters Files that are located on your FS98 CD that are read into the cache to speed access times. You can modify, edit, or delete these files in the scenery library.

Phonetic alphabet A system that replaces each letter of the alphabet with a word signifying that letter. The phonetic alphabet is used by pilots to avoid verbal miscommunication.

Pilotage A method of navigation using visible landmarks and an aeronautical chart.

Pitch Rotation around the lateral axis of the plane. Nod your head up and down to get an idea of pitch.

Primary flight instruments The six main instruments used for flight—the airspeed indicator, the attitude indicator, the altimeter, the turn coordinator, the heading indicator, and the vertical speed indicator.

Radials Signals emitted from a VOR station that radiate outward, like spokes of a wheel. By tuning in a VOR station on the OBI, the pilot can select a radial using the course selector, and the OBI will display the aircraft's position relative to that particular radial.

Rate of climb Change in altitude over time. This is represented by the vertical speed indicator (VSI) in hundreds of feet per minute.

Relative wind Air flowing over the object going through the air. The flight path of an airplane is directly opposite the relative wind.

Ridge lift Air currents deflected upward as wind hits the side of a ridge. Sailplanes use this lift to gain altitude. *See also* **Thermal**.

Rotate Pulling back on the yoke to raise the plane's nose off the ground during takeoff.

Rotation speed The speed at which the pilot should start to pull back on the yoke during takeoff. On the Cessna, this is generally around 70 knots.

Rudder A moveable control surface located on the tail that compensates for the plane's yaw and allows you to control the airplane in a turn.

Slip In a slip, opposite rudder is added to a turn, making it possible to bank the plane while keeping a consistent heading. This comes in handy when landing in a crosswind.

Skid In a skid, the rate of turn is not sufficient for the bank angle. You can compensate for a skid by increasing the bank angle or reducing the amount of rudder.

Spoilers Spoilers are used on the sailplane to increase your rate of descent without increasing speed.

Spool up The process by which jet engines power up to full.

Stall A stall occurs when an aircraft's angle of attack is too great for the wings to continue to provide lift. Any airplane will stall if the wing's critical angle of attack is exceeded—regardless of airspeed.

Stall speed The stall speed is the speed at which the critical angle of attack is exceeded.

Taxi The movements of airplanes on the ground, usually guided by the air traffic control tower.

Thermal Warm currents of air that rise up from dark patches of ground. Sailplanes can rise on these thermals.

Throttle This controls the amount of air that enters the engine.

Thrust The force produced by the engine or propeller.

Traffic pattern A defined pattern that all airplanes fly when approaching an airport.

Transponder Radio equipment in an aircraft that broadcasts information about the aircraft to air traffic control.

Trim Trim tabs allow you to make slight adjustments to the wing surfaces to relieve you from having to maintain constant pressure on the yoke.

True airspeed An airplane's airspeed that compensates for changes in air density at altitude. Because the air is thinner as you gain altitude, indicated airspeed will read a little lower than true airspeed, which needs to be taken into account when planning flight plans and navigation.

Turn coordinator This instrument indicates the bank of the plane. A small ball in the turn coordinator also indicates whether you are making a coordinated turn.

Uncoordinated flight In this mode of flight, the rudder moves independently of the yoke; you will need to control both the rudder and the yoke to get a smooth turn.

Visual flight rules (VFR) A set of rules you have to follow to fly in good weather. *See also* **Instrument flight rule**.

Yaw Rotation around the vertical axis of the plane. Shake your head from side to side to get an idea of yaw.

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